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FOURTEENTH ANNUAL REPORT

OF THE

North Dakota Agricultural Experiment Station

AGRICULTURAL COLLEGE, NORTH DAKOTA

TO THE

GOVERNOR OF NORTH DAKOTA

BISMARCK, N. D.
TRIBUNE, STATE PRINTERS AND BINDERS
1904

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STATION STAFF.

J. H. WORST, LL.D. ..... Director
E. F. LADD, B. S. ..... Chemist
C. B. WALDRON, B. S. ..... Horticulturist
H. L. BOLLEY, M. S. ..... Botanist
J. H. SHEPPERD, M. S. A. ..... Vice Director and Agriculturist
L. VAN ES, M. D. V. S. ..... Veterinarian
L. R. WALDRON, M. A. ..... Assistant Botanist
T. R. MANNS, B. S. ..... Assistant Botanist
J. C. MCDOWELL, B. Agr. ..... Assistant Agriculturist
O. A. THOMPSON, B. S. ..... Superintendent Edgeley Sub-Station
E. G. SCHOLLANDER ..... Assistant in Plant Breeding
NICHOLAS GREST ..... Farm Foreman
C. E. NUGENT ..... Secretary

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LETTER OF TRANSMITTAL.

AGRICULTURAL COLLEGE, N. D.,
February 1, 1904.

Hon. Frank White, Governor of the State of North Dakota:

SIR: As required by act of congress approved March 2, 1887, I hereby submit the Fourteenth Annual Report of the North Dakota Experiment Station for the year ending February 1, 1904, together with a financial statement of receipts and disbursements, as required by law, for the government fiscal year ending June 30, 1903.

Very respectfully yours,

ALEX. STERN,
President Board of Trustees.

REPORT.

To the Board of Trustees of the North Dakota Agricultural College and Experiment Station:

GENTLEMEN: I have the honor to submit to you the Fourteenth Annual Report of the North Dakota Government Experiment Station.

The following bulletins were published during the year:

No. 55. Flax and Flax Seed Selection.
No. 56. Noxious Weeds and How to Kill Them.
No. 57. Some Food Products and Food Adulterations.
No. 58. Some Stock Poisoning Plants of North Dakota.

FARMERS' INSTITUTES.

Since the Thirteenth Annual Report was published, farmers' institutes were held at Fingal, Wimbledon, Kensal, Carrington, Cathay, Harvey, Kenmare, Carpio, Milnor, Barney, Wahpeton, Hamilton, Drayton, Grafton, Langdon, Park River, Larimore, Valley City, McHenry and Cooperstown.

INSTITUTE CORPS.

The institute corps consisted of M. F. Greeley conductor, editor of the Dakota Farmer, published at Aberdeen, S. D.; Bertha Dahl Laws, of Appleton, Minn.; A. K. Bush, Dover, Minn.; D. S. DeLancy, Valley City, N. D.; E. G. Schollander, Agricultural College; Thomas Convey, Ridgway, Wis.; L. D. Stilson, York, Neb.; N. S. French, Berlin, N. D.; T. A. Hoverstad, Crookston, Minn., and O. A. Thompson, superintendent Edgeley Sub-Experiment Station. The work of conducting institutes, however, was mainly in charge of Mr. Greeley and Mr. Bush.

As heretofore, the demand for farmers' institutes has far exceeded the ability of the institute board to supply speakers, notwithstanding the material increase of the appropriation by the last legislative assembly for institute work. Many one-day institutes had to be scheduled where two-day institutes would have been more satisfactory, and quite a large number of petitions for institutes were received that could not be entertained for want of funds. The growing demand for farmers' institutes and their economic advantage to the farming community fully warrants the most liberal appropriations for conducting them that is consistent with the financial con-

ditions of the state and the relation which agriculture bears to the other interests of the commonwealth.

IMPROVED BREEDS OF STOCK.

The Experiment Station has made some progress in the improvement of live stock, having recently purchased a young Shorthorn bull of exceptional quality. Also four Shorthorn and four Hereford heifers of the best breeding types have been recently added to the Station herd.

A thoroughbred Rambouillet ram and eleven pure bred ewes of the same breed have been added to the Station flock. A start has also been made in securing pure bred pigs.

It is the policy of the Station to secure as rapidly as possible, pure bred cattle, sheep and hogs of the strains best adapted to local conditions.

Not having any available funds for the purchase of the above mentioned stock, some of the less desirable animals belonging to the Station were disposed of and the pure bred stock partly paid for from the proceeds of such sales. For the balance the Station had to go in debt.

Considerable attention has been given to experiments with poultry raising and egg production during the past year, with encouraging results. The experiments will be more extended during the coming year.

THE STATION DEPARTMENTS.

The reports from the several departments for the past year, found elsewhere in this report, are of unusual interest. Lack of funds for initiating important experiments and for enlarging the scope of investigations now under way proves a serious handicap to the Station staff. Another serious matter is the frequent changes that occur among the assistants in the Department of Agriculture. Other stations and even private parties overbid us in the payment of salaries and take away our help almost as fast as it becomes well trained for special work. The state should provide not less than $15,000 annually as its equitable share for the support of the Experiment Station. The annual investment of that sum would enable the Station to retain efficient men in its service for longer periods, and in general results it would return the appropriation to the state many fold annually. At the present time North Dakota is one of the few states that does not co-operate, at least equally, with the federal government in the work of experimentation.

As will be found in the report of the State Veterinarian, cattle scabies has become seriously prevalent on the western ranges. The Station will continue to devote its best energies to eradicate this evil, and reasonably expects, through co-operation with the state

government and the United States Department of Agriculture, to see the disease completely stamped out. The Department of Veterinary is working to great disadvantage for want of a suitable building for making experiments with diseased stock and for dissecting animals. The Departments of Agriculture and Horticulture are also without buildings suitable for their special lines of work—not even having a place where seeds can be protected from the mice and rats.

An effort will be made to experiment to some extent with grasses and forage crops in the grazing sections of the state the coming year. This important work was projected a year ago, but the Station was prevented from doing anything for want of funds. Where, from overstocking or other causes, the native grasses are disappearing from the ranges, an honest effort should be made to improve the pastures, and experiments also should be made with forage crops with a view to supplementing the native hay for winter feed.

The home Station will continue the line of experiments heretofore inaugurated and initiate additional experiments as occasion demands. The rotation experiments were very gratifying the past year, and will be continued; also experiments looking toward the development of a strain of flax that will be immune from the disease known as flax wilt.

The Sub-Station located at Edgeley, for the past year superintended by O. A. Thompson, under the direction of Vice Director J. H. Shepperd, and assisted by Prof. C. B. Waldron, horticulturist, was gratifying in the results obtained, notwithstanding the money and energies available were largely used for the erection of buildings, for fences, team and farm implements. I respectfully call your attention to the report of the agriculturist for a more detailed account of the results obtained at the Edgeley Sub-Experiment Station. I also invite your special attention to the work of the state pure food commissioner and his recommendations.

J. H. WORST,
Director.

CHEMICAL DEPARTMENT.

To J. H. Worst, Director:

SIR: I present herewith my Fourteenth Annual Report as chemist of the North Dakota Government Agricultural Experiment Station for the year 1903.

Many of the lines of investigational work in progress during the year are not completed, and the data is reserved until more definite results and conclusions can be presented. The principal lines of work for the year have been with soils, food products, waters, fertilizers and their influence on wheat production, and breeding wheats and corns for high proteids.

The amount of correspondence during the past year has increased more than 150 per cent over that of the preceding year. During the year 1,661 letters have been written and about 1,500 postal card notices have been sent out. The copy books show 1,928 pages of letters written by the department. Often the questions asked have required considerable work to find the data necessary to give an intelligent answer, and in some instances special analyses have been undertaken in order to aid the questioned. Our records show that not less than 9,500 determinations and tests have been made during the year just closed.

The department has been very seriously hampered for lack of proper room or facilities for conducting the work of the Station and College. At times we have felt that our work is far from being creditable to the institution. When one examines the conditions under which we have been forced to carry out our work and experiments, one may well wonder how anything could be accomplished. I quote from my last annual report on this point as follows:

"I do not know of another experiment station department of chemistry in this country so poorly housed and provided for doing work as our own, and this, too, in one of the states almost purely agricultural."

In addition to our regular duties there has been placed a new duty upon the department, that of analyzing foods and passing upon the purity of all food products and beverages sold in the state of North Dakota.

LAW REGULATING THE SALE OF COMMERCIAL FERTILIZERS.

In our last annual report we called attention to the need of a law to regulate the sale of commercial fertilizers in the state, and pointed out that, while the amount of fertilizers used is very small at the present time, there was a tendency on the part of certain parties to induce farmers to make an experiment with the use of fertilizers, and that, in some instances, the fertilizers supplied were almost worthless for the purpose for which they were intended.

At the last session of the legislature, a law such as we suggested was enacted, making it the duty of the Experiment Station to inspect the fertilizers, and to see that the same were what they purported to be. We give herewith a copy of the law as it now stands.

SALE AND ANALYSIS OF COMMERCIAL FERTILIZERS.

An Act to Regulate the Sale and the Analysis of Commercial Fertilizers, and Prescribing a Penalty for the Violation Thereof.

Be It Enacted, etc.:

SECTION 1. Every person who shall sell, offer or expose for sale in this state any commercial fertilizer or any material to be used as a fertilizer, the selling price of which exceeds five dollars per ton, shall stamp on or affix to each package of such fertilizer, in a conspicuous place on the outside thereof, a plainly printed statement which shall certify as follows:

1. The number of net pounds of fertilizer in the package sold or offered for sale.
2. The name, brand or trade mark under which the fertilizer is sold.
3. The name and address of the manufacturer of the fertilizer.
4. The chemical composition of the fertilizer expressed in the following form and order:

.....per cent phosphoric acid soluble in water.
.....per cent phosphoric acid reverted.
.....per cent phosphoric acid insoluble.
.....per cent phosphoric acid total.
.....per cent nitrogen in nitrates.
.....per cent nitrogen as ammonia.
.....per cent nitrogen total.
.....per cent potash soluble in water.
.....per cent chlorin.

If any such fertilizer be sold, offered or exposed for sale in bulk, such printed statement shall accompany every lot and parcel so sold, offered or exposed for sale.

SEC. 2. It shall be a violation of the provisions of this act if the statement required by section 1 of this act shall be false in regard

to the number of net pounds of fertilizer in the package sold, offered or exposed for sale, or in the name, brand or trade mark under which the fertilizer is sold, or in the name and address of the manufacturer of the fertilizer. It shall also be a violation of the provisions of this act if any commercial fertilizer or material to be used as a fertilizer shall contain a smaller percentage of nitrogen, phosphoric acid or potash than is certified therein, when such deficiency shall be greater than one-third of one per centum of nitrogen, or one-half of one per centum of available phosphoric acid (or one per centum of the total phosphoric acid in the case of the undissolved bone), or one-half of one per centum of potash soluble in distilled water.

SEC. 3. Before any commercial fertilizer or any material to be used as a fertilizer is sold, offered or exposed for sale in this state, the manufacturer, importer or person who causes the same to be sold, offered or exposed for sale shall file with the North Dakota Government Agricultural Experiment Station a certified copy of the statement prescribed in section 1 of this act, and, in addition, such statement shall be filed thereafter annually during the month of December. Each maufacturer, importer or person, before selling, offering or exposing for sale in this state any brand of commercial fertilizer, shall annually, during the month of December, pay to the director of the North Dakota Government Agricultural Experiment Station a license fee of twenty dollars for each and every brand of fertilizer bearing a distinctive name, brand or trade mark, which said manufacturer, importer or person is to sell, offer or expose for sale in this state during the calendar year next succeeding said payment; provided, always, that the placing of any new brand upon the market at any time during the calendar year shall be preceded by such payment. Each manufacturer, importer or person who has complied with the provisions of this act relative to filing the aforesaid certified statement and to the payment of the aforesaid license fee shall be entitled to receive a certificate from the director of the said station setting forth said facts. Said director shall pay all money received as aforesaid to the treasurer of the North Dakota Government Agricultural Experiment Station, which treasurer, when said money is so appropriated by the board of trustees of said station, shall pay the money so received, or so much of it as may be necessary in maintaining the expenses of enforcing the provisions of this act. Said board of trustees shall report annually the expenditures so incurred for salaries, laboratory expenses, chemical supplies, traveling expenses and printing.

SEC. 4. No person shall sell, offer or expose for sale in this state leather, or its products of other inert nitrogenous material in any form, as a fertilizer or as an ingredient of any fertilizer, unless an explicit printed statement of the fact shall be conspicuously affixed to every package of such fertilizer, and shall accompany every parcel or lot of the same.

SEC. 5. Every person violating any of the provisions of this act shall forfeit and pay to the people of the state of North Dakota the sum of one hundred dollars for every such violation.

SEC. 6. Every certificate, duly signed and acknowledged by the chemist of the North Dakota Government Agricultural Experiment Station at Fargo, relating to the analysis of any commercial fertilizer, shall be presumptive evidence of the facts therein stated.

SEC. 7. The doing of anything prohibited by this act shall be evidence of the violation of the provisions of this act relating to the things so prohibited, and the omission to do anything directed to be done shall be evidence of a violation of the provisions of this act relative to the things so directed to be done.

SEC. 8. The director of the North Dakota Government Agricultural Experiment Station is charged with the enforcement of the provisions of this act, and for this purpose may employ agents, chemists and experts, and whenever he shall know or have reason to believe that any penalty has been incurred by any person for the violation of any of the provisions of this act, or that any sum has been forfeited by reason of any such violation, he shall report the said violation with a statement of the facts to the state's attorney for the district wherein the offense is committed, who shall begin proceedings according to the state law.

SEC. 9. This act shall take effect when approved.

Approved March 19, 1903.

SUMMARIES OF TEMPERATURES, RAINFALLS AND SUNSHINES.

Below are given the summaries by months of the daily meteorological observations made during the year. In the preceding annual reports are given the data for former years beginning with 1892:

TEMPERATURE AND RAINFALL—1903.

Month	Mean	Maximum	Minimum	Rainfall—Inches
January	7.0	46	—30	.83
February	2.5	40	—38	.45
March	22.1	50	— 5	.42
April	42.7	76	14	1.34
May	55.7	89	23	2.78
June	62.3	97	33	.56
July	65.8	95	37	2.62
August	62.2	92	37	4.61
September	52.0	83	22	5.61
October	45.2	72	11	2.49
November	23.6	73	—15	.10
December	11.8	37	—25	1.00
Average and totals	37.7	70.9	5.4	23.81

The rainfall for 1903 has been 2.93 inches above the average for the past twelve years. While the rainfall for the year has been above the average, yet for the first six months the rainfall was exceptionally low for the month of June, being but .56 inches. The unusual distribution of rain resulted in retarding much the growth of all cultivated crops, but the rain for July, although far below the average for the month, produced a good yield of grain, especially of wheat.

The rainfall since 1892 is given in the following record:

	1892	1893	1894	1895	1896	1897
Rainfall—inches	20.73	16.17	18.72	16.05	21.77	22.50

	1898	1899	1900	1901	1902	1903
Rainfall—inches	16.36	21.20	25.54	25.68	23.16	23.81

This gives an average annual rainfall of 20.88 inches for the past twelve years, with a minimum of 16.05 inches in 1895 and a maximum of 25.68 inches for 1901.

The rainfall by months for the past nine years is shown in the following table:

RAINFALL BY MONTHS.

Month	1895	1896	1897	1898	1899	1900	1901	1902	1903
January	.36	1.90	.35	.06	.29	.45	.05	.18	.83
February	.12	.06	.77	.10	.29	.54	.11	.34	.45
March	0	.48	.96	.34	1.58	1.23	1.31	1.42	.42
April	1.36	3.64	.89	.28	1.39	1.82	1.76	2.30	1.34
May	1.62	4.70	.74	4 15	4.22	.81	.98	4.25	2.78
June	4.81	2.41	7.10	2.25	3.44	2.11	5.91	3.07	.56
July	3.24	.91	8.24	2.59	2.78	3.91	7.29	2.54	2.62
August	1.59	2.17	.77	2.84	3.71	8.28	1.59	2.95	4.61
September	1.55	2.58	.57	1.23	1.24	3.27	2.57	.58	5.61
October	.14	1.96	1.81	1.62	1.67	2.80	3.83	5.17	2.49
November	1.16	.70	.25	.08	.27	.20	0	.19	.10
December	.10	.26	.04	.22	.33	.12	.28	.17	1.00
Summary	16.05	21.77	22.50	16.36	21.21	25.54	25.68	23.16	23.81

MONTHLY RECORD OF SUNSHINE.

A Friez photographic sunshine recorder is employed for preserving the record of sunshine by months. No correction is made for early morning and evening sunshine, which is about 12 or 15 per cent greater than the indicated sunshine as shown upon the record.

SUNSHINE RECORDED—1903.

Month	Total Hours		Hours Daily Mean		Percentage Possible Sunshine
	Possible	Recorded	Possible	Recorded	
January	278.9	80.9	8.99	2.60	29.83
February	287.1	172.9	10.2	6.17	60.19
March	369.0	117.4	11.9	3.78	29.76
April	407.3	185.5	13.5	6.18	46.20
May	466.3	239.8	15.04	7.73	51.29
June	475.0	267.5	15.8	8.9	56.36
July	480.2	223.5	15.4	7.2	46.32
August	.....	.....	.....	.....	.....
September	378.3	137.1	12.61	4.57	37.47
October	337.6	153.2	10.5	4.9	46.23
November	281.6	81.4	9.38	2.7	29.3
December	272.1	54.7	8.7	1.7	20.1
Total or mean	4,013.4	1,013.9	12.00	5.22	41.18

In the accompanying table is shown the percentage of actual recorded sunshine by months for the past five years.

PER CENT OF SUNSHINE BY MONTHS.

Month.	1899	1900	1901	1902	1903
January	31.3	37.8	40.0	44.4	29.83
February	51.9	50.0	50.2	46.0	60.19
March	55.5	44.9	48.9	36.7	29.76
April	61.6	65.8	42.7	51.3	46.20
May	39.1	68.2	64.8	48.6	51.29
June	52.2	55.1	40.4	49.6	56.36
July	63.7	56.1	53.5	60.5	46.32
August	42.8	36.4	57.9	46.9	.....
September	58.7	38.9	55.8	51.4	37.47
October	29.4	31.2	57.7	43.0	46.23
November	39.3	36.6	42.8	29.3	29.3
December	47.7	30.2	22.3	32.1	20.1
Mean	48.8	47.1	49.43	45.2	41.18

The total hours of recorded sunshine and the percentage of possible sunshine for the past five years is summarized in the following table:

	1899	1900	1901	1902	1903
Total hours recorded	2,166.85	2,116.5	2,203.7	2,034.8	1,813.9*
Daily mean hrs. recorded	5.97	5.70	6.05	5.61	5.22
Percentage of sunshine	48.8	47.1	49.43	45.2	41.18

* The record for 1903 is deficient for the entire month of August. The instrument was tampered with and the record destroyed.

The percentage of sunshine has regularly decreased from 48.8 per cent to 41.18 per cent from 1899 to 1901. The records show a higher rainfall for the same period.

EVAPORATION FROM A WATER SURFACE.

This experiment was conducted in the same manner as for the preceding year and given in the Thirteenth Annual Report, page 20.

The table shows the amount of water evaporating daily, expressed in inches:

Date	May	June	July	August	September
1	.05	.0	.39	.07	.20
2	.20	.10	.06	.05	.55
3	.06	.20	.23	.24	.05
4	.04	.30	.30	.62	.04
5	.16	.40	.36	.50	.20
6	.20	.20	.55	.50	.0
7	.19	.39	.60	.70	.0
8	.07	.21	.50	.15	.0
9	.12	.18	.50	.40	.0
10	.20	.20	.49	.0	.20
11	.10	.20	.28	.40	.0
12	.10	.40	.40	.10	.0
13	.30	.20	.50	.20	.0
14	.10	.42	.60	.30	.06
15	.20	.42	.23	.30	.0
16	.30	.50	.39	.50	.20
17	.20	.40	.25	.60	.10
18	.02	.30	.60	.13	.20
19	.33	.16	.30	.65	.20
20	.20	.13	.43	.50	...
21	.0	.40	.40	.48	...
22	.05	.20	.60	.65	.30
23	.30	.30	.60	.0	.10
24	.20	.20	.50	.0	.30
25	.0	.50	.10	.0	.33
26	.20	.30	.80	.0	.10
27	.10	.40	.20	.03	...
28	.10	.25	.70	.0	.20
29	.20	.42	.50	.0	.22
30	.0	.41	.30	.10	...
31	.0	...	.60	.30	...
Total mean	4.30	8.69	13.26	12.07	3.55
Daily mean	.138	.289	.427	.387	.137

The total amount of water evaporated from a water surface for the five months May to September, inclusive, was 41.87 inches, or an average of 8.37 inches per month, or a daily average of .263 inches.

The summary by months is given in the following table, also that for 1902:

INCHES EVAPORATION FOR 1902 AND 1903.

	1902	1903
May	6.48	4.30
June	5.75	8.69
July	4.77	13.26
August	6.62	12.07
September	4.50	3.55
Total	28.12	41.87

The amount of evaporation for the months May to August, inclusive, for the season of 1903 was 38.34 inches, as compared with 23.62 inches for the same period of 1902. The rainfall for the same period was 10.57 inches for 1903 and 13.71 inches for 1902.

The results of our tests for evaporation for the two growing seasons are interesting, and, taken in connection with the uncompleted results from soil surfaces, furnish some interesting and instructive data. This experiment will be continued through several seasons.

The rainfall for the same period of term was by months as follows:

INCHES OF RAINFALL.

	1902	1903
May	4.25	2.78
June	3.97	.56
July	2.54	2.62
August	2.95	4.61
September	.61	5.61
Total	14.32	16.18

EXPERIMENTS WITH COMMERCIAL FERTILIZERS.

At the request of the Amour Fertilizer Works, South Omaha, Neb., in the spring of 1903 we undertook some experiments to determine to what extent the use of commercial fertilizers would increase the yield of wheat. The experiments were made on the station grounds, and samples of the fertilizers were furnished to farmers in different parts of the state, with the request that they apply the same at the rate of 200 pounds per acre to their wheat fields, carefully note the results and make a general report at the time the crops were harvested. The fertilizers were furished to the following parties:

J. A. Power, Power, N. D.
Sub-Experiment Station, Edgeley, N. D.
J. A. Davis, Buxton, N. D.
Dugald Campbell, Armstrong, N. D.
Col. W. W. McIlvain, Enderlin, N. D.
Experiment Station, Agricultural College, Fargo.

To each of these was sent a quantity of the following fertilizers: Acidulated Bone Meal, Amour's Grain Grower, Ammoniated Bone with Potash, All Soluble. These fertilizers were furnished by the

Amour Fertilizer Works for this experiment. We also sent a quantity of sodium nitrate, furnished by the Chilian Nitrate Works, through the courtesy of its director, William S. Myers.

When the crop was harvested and threshed in the fall, the farmers reported that they were unable to see that there was any advantage in favor of the use of the fertilizers; that possibly the wheat where the nitrate of soda was used was more stalky and continued its growth somewhat later than was the case with the other grains.

EXPERIMENTS AT THE STATION.

At the Experiment Station, where the facilities were such that the work could be done more satisfactorily, and accurate records could be made and weights made of the harvested crop and the actual data secured for yield of wheat per acre, we have a means of determining to what extent the several fertilizers influenced the yield of wheat.

The guaranteed analysis for the several fertilizers furnished by the Amour Fertilizer Works is shown in the following table:

	Acidulated Bone Meal	Amour's Grain Grower	Ammoniated Bone and Potash	All Soluble
Nitrogen	1.64 to 2.47	1.65 to 2 47	2.47 to 3.29	2.88 to 3.7
Ammonia	2 to 3	2 to 3	3 to 4	3.5 to 4.5
Total phosphoric acid	18 to 22	10 to 12	8 to 10	10 to 12
Available phosphoric acid	11 to 14	8 to 10	6 to 8	8 to 10
Water soluble phosphoric acid	8 to 12	.....	4 to 6	2 to 4
Potash, muriate	.....	3.17 to 4.75	.....	.....
Potash, sulphate	.....	.....	3.70 to 5.50	7.40 to 9.25
Potash, K_2O	.....	2 to 3	2 to 3	4 to 5
Equal bone phosphate	39 to 48	.....	.....	.....

In addition to the above, on plot No. 104 an application of nitrate of soda was made, and on plot 105 ten loads of well rotted manure were applied, while plot 106 received no fertilizer.

The ground on which this experiment was made had grown wheat or other grain crops continuously for more than twenty years and without the addition of fertilizers of any kind, so that the conditions were favorable for the experiment, at least so far as concerns lands in the Red River valley which have been continuously in wheat farming since the prairie was first broken.

The experiments were directly in charge of Mr. E. G. Schollander, who makes the following statements regarding the results:

FERTILIZER EXPERIMENT RESULTS—1903.

Analysis No.	Name of Fertilizer	Length of Stem	Length of Heads	Yield Per Acre—Bushels	Weight Per Bu.—Pounds	Per Cent Lodged
100	Acidulated Bone	37 in.	3¼ in.	30.40	59.75	10
101	Amour's Grain Grower	37 in.	3½ in.	33.20	59.50	5
102	Ammoniated Bone	37 in.	3 in.	32.20	61.25	20
103	All Soluble	36½ in.	3½ in.	31.90	60.00	8
104	Nitrate of soda	37½ in.	3¼ in.	33.00	59.50	10
105	Rotted manure	35½ in.	3¼ in.	29.50	60.00	10
106	No fertilizer	34 in.	3 in.	25.70	60.00	3

NOTE.—The first part of the season there was no noticeable difference on any of the plots, but the latter part of the season it was readily seen that No. 106 did not stand as thick on the ground nor heads as well filled as the other plots.

Two hundred pounds per acre of the different fertilizers were used on Nos. 101, 102, 103 and 104. Ten loads of well rotted manure per acre were used on No. 105, and no fertilizer of any kind on No. 106. This was used as a check plot.

E. G. SCHOLLANDER.

The results shown in the table indicate the largest yield on the ground where Amour Grain Grower Fertilizer was used. Here the yield was at the rate of 33.2 bushels as against 25.7 where no fertilizers were added. This shows an increase of 7.5 bushels per acre as the result of adding 200 pounds of the fertilizer. The yield where nitrate of soda was added was only .2 of a bushel less than that in favor of the Amour Grain Grower Fertilizer.

It will be noticed also that the addition of rotted manure at the rate of ten loads per acre made an increase of 3.8 bushels per acre.

It is proposed to continue this line of experiments and determine to what extent the use of fertilizers will add to the yield of the wheat crop, both at the Experiment Station and at the Sub-Station at Edgeley.

In order to determine to what extent the fertilizer might influence the amount of ash or mineral constituents of the wheat and the proteid content, determination was made in each case with results as given below:

Plot	Name of Fertilizer	Ash	Proteid N x6.25
100	Acidulated Bone	1.91	12.97
101	Amour's Grain Grower	1.82	14.18
102	Ammoniated Bone	1.90	12.22
103	All Soluble	1.92	13.68
104	Nitrate of soda	1.81	14.12
105	Rotted manure	2.07	12.63
106	No fertilizer	1.95	13.06

From the analysis it will be noticed that the fertilizers which gave the largest yield per acre also produced a wheat containing the highest proteid content and the smallest per cent of ash.

SOIL STUDIES.

One phase of soil investigation was assigned to Hugh McGuigan for study, and while the work is only fairly under way, it is believed that some points have been established and are pointed out in his preliminary paper, which I include with this report. An effort has been made to determine differences in humus from different sources, and from the same soil under different conditions of cultivation and farming.

It has been found that when fractional precipitation is employed with humus extracts very different results are had with varying conditions of soils. In some cases all of the humus is precipitated in the first fractional, and in other cases all may come down in the last fractional, and in other cases about the same amount will be had for each precipitation. It has been found, however, that these several precipitates have very different values and widely varying compositions. This problem is now being further investigated, and it is believed results can be had which will throw much light upon some of the problems not well understood.

Another point too much overlooked, especially in newspaper discussions of humus questions, is the fact that there are many kinds of humus, as there are many kinds of food products. Roughly it may be said that there are nitrogenous humuses and carbonaceous humuses with all the gradations, just as foods may be classed as nitrogenous and carbonaceous foods. These have different values in the soil as widely varying as the foods themselves. Humus from green clover and clover roots is very different from humus produced from, say, wheat straw and wheat roots.

How do each of these classes of humus affect the mineral plant food constituents of the soil? How do they influence the physical condition of the soil? These and many other related questions can be answered with advantage to practical agriculture.

HUMUS AND ITS RELATION TO AVAILABLE PLANT FOOD.

BY HUGH M'GUIGAN.

With the cultivation of cereals, mankind shows an advancement from the barbarous to the civilized state. As soon as knowledge of the importance of the cereals as a food has disseminated amongst a people, the conditions necessary for their easier and more profitable production begin to be studied. For this reason we find that the regions where grain could be raised easiest and most abundantly were the most prosperous and populous. It was by reason of their agricultural advantages that the valleys of the Nile, Tigris and Euphrates were former seats of power and progress. In time, however, the inherent power to produce crops which a region possesses will, by reason of continual cropping, be shorn of its power, unless the conditions necessary for its preservation are understood and a proper course pursued. Because of the violation of nature's laws, regions which were formerly the centers of prosperity are now barren wastes with scarcely anything to indicate their former fertility The exhaustion of the soil became visible at an early date, and in many cases was treated successfully though empirically. With the development of chemistry, and especially agricultural chemistry, the reason for each treatment has been questioned, and, in many cases, definite answers given. These answers, however, were not obtained without a controversy ranging over a period of some fifty years, and still there are unsettled questions.

EARLY VIEW OF HUMUS AND ITS USES.

The most fertile fields everywhere are noticeable for the amount of vegetable mould or humus they contain. The value of humus as a plant food has been much discussed and today remains a vulnerable question. Many beautiful theories relating to value, composition and production were raised only to be rendered untenable by the definite decision of experiment. Previous to the time of Liebig (1803-1873) the wonderful powers of virgin soils and the decrease of these powers by continued cropping had so impressed agriculturists that it was almost universally believed that their productiveness was entirely due to the larger amounts of vegetable moulds which these soils contained. Many vegetable physiologists held that it was the chief nutriment of plants. Although their theories seemed plausible, yet they were not entirely satisfactory, and investigation of the matter was continued. The first to study the sub-

ject with any measure of scientific satisfaction was Justus Von Leibig. He observed that humus is of very variable composition; it is soluble in water only when freshly precipitated; it becomes almost entirely insoluble after drying or freezing, so that both the heat of summer or cold of winter render it insoluble, at least so far that it, or its constituents, is of very little worth as an assimilable plant food. Before a substance can be utilized by plants, it must be soluble; hence at first sight it was seen that humus as it is found in the soil cannot be used as a plant food. Physiologists did not deny this, but to overcome the difficulty they assumed that the alkalies, lime, etc., found in the ashes of plants render the humus soluble, hence assimilable. As one part of the lime will combine with almost eleven parts of humic acid, the hypothesis seemed possible. To test the validity of the hypothesis Liebig made numerous calculations, and showed a doubt that the available humus on a given area is far too small to account for the vegetable raised there, even after granting numerous impossibilities in favor of the theory. "He showed that the proportion of carbon produced on an acre of cultivated land from such various crops as fir wood, pine wood, beech wood, beet root, rye and hay is remarkably constant under dissimilar conditions of cultivation. Also that carbon may be removed to some extent from a forest or meadow, in the form of wood or hay, and that in spite of this the soil will become richer, not poorer, in carbon. And finally he clinched the argument by pointing out that since it is universally admitted that humus is only produced by the decay of plants, no primitive humus could have existed for the first plants, for plants must have preceded humus." Such was the disposal of the humus theory, and must be forever discarded by reasonable men.

Carbonaceous vegetable matter while oxidizing does improve the physical condition of the soil and act beneficially in other ways, but it is not entirely necessary, as plants grow in earth in which it is entirely absent. This, however, does not diminish its practical importance in the soil, nor should it encourage negligence in its preservation.

Priestly, before Liebig's time (1771), had proven that plants in sunlight absorb carbon dioxide from the air and give off oxygen, and in England at least, some inclination to regard the air as the source of the carbonaceous material was shown, until Ingenhouz discovered that, although the above process takes place in daylight, yet the reverse is true in darkness. It was this latter discovery that gave strength to the humus theory and preserved it until the time of Leibig (1840).

We know now that the discovery of Ingenhouz is more of a quantitative character. Although the discovery misled many botanists and plant physiologists, yet it was found to be far from sufficient to counterbalance the carbon dioxide taken up during the day. Humphry Davy showed plainly the production of oxygen from carbon dioxide

by plants by growing grass under receivers in water with an air supplied with small additional quantities of carbon dioxide gas. After a lapse of eight days the air in the receiver was found to be decidedly enriched with oxygen, proving, at least, that plants take part of their carbon dioxide from the air.

LATER VIEWS ABOUT HUMUS.

Having, to a certain degree, determined the source of the carbon dioxide for plants, the next question, and the question still unanswered, is to determine the composition and work of humus in the soil. When it was believed that plants derived their carbonaceous matter from the soil, physiologists believed that humus must be particularly nutrient, because in composition it differed from wood chiefly in containing an excess of carbon. "Like wood, it contained carbon, together with hydrogen and oxygen, in the proportions which they combine to form water, but relatively to the proportion of carbon the proportion of water is less. Misled by this fact the physiologists concluded that this similarity of composition between humus and the constituents of plants must favor the assimilating of the former plants. Humus had only to unite with water to form woody fibre."

This reasoning from analogy proved very erroneous, for no vital characters of the plant justify the assumption that the vital processes of plants and animals are similar.

Plant life consists of the elaboration of sugar, gums, starches and the like, substances entirely necessary for animal life; and humus, which is apparently an analogous substance, could hardly be considered as a plant food. While it is not a direct plant food, it is almost as important in the soil as though it were. It is true that a great many soils can produce a crop without a great deal of it, yet in regions which are subject to long periods of drouth, as in the Dakotas, it is the only reliable insurance against crop failure. Just how much study can be given it with propriety can be seen by every one interested in the preservation of soil fertility.

SOME FUNCTIONS OF HUMUS.

While we do not know the entire role played by it, yet we can give some of the beneficial effects of its presence. The first of these is the physical condition. Soil containing an abundance of vegetable matter is much easier tilled than those deficient in it. They also preserve a more uniform temperature, hold more hygroscopic moisture, and crops growing on such do not suffer the destructive effects of hot winds or drouth as those growing on a soil poorer in humus. This is especially noticeable between crops growing in the Red River valley and those on the higher and humus deficient soils outside of it. Both are subject to the same climatic conditions. This ability to withstand drouth and hot winds is largely due to the much greater

water holding capacity of the soils richer in humus. The following figures give the amounts of humus found in different soils and the water holding capacity of each, volatile matter, etc., due to its presence. The samples were taken from plots marked 2 and A. Both of these have been under continuous cultivation for twenty years. On 2 there has been wheat continuously, while A has grown grain, wheat, oats and barley for a similar period. Results from the first and second six inches are given:

TABLE I.—HUMATES, HUMUS AND WATER HOLDING CAPACITY OF SOIL.

Sample Soil	Humates	Humus	Water Holding Capacity—Per Cent
Virgin sod, first six inches	6.80	4.78	82
Virgin sod, second six inches	9.54	3.54	68
Plot 2, first six inches	9.40	5.06	68
Plot 2, second six inches	8.16	3.45	64
Plot A, first six inches	13.10	4.75	76
Plot A, second six inches	10.00	3.70	64

Two years later we made a comparison of a dozen rotation plots of the same kind of soil, to see the effects of rotation on the amounts of humus, water capacity, etc., and found that with a proper rotation the virgin strength and productiveness may be reserved if not increased. It is needless to give a table of the complete results, a comparison of 2 and 18, which show the greatest difference, will be sufficient. Number 2 has had wheat continuously for twenty-three years. Number 18 has been under cultivation for a similar period, but the wheat was rotated only since 1892, as follows:

1892, peas.
1894, clover.
1895, fallow.
1899, peas.
1903, clover.

With soils taken from the first ten inches we obtained the following results:

Sample Soil	Humates	Humus	Water Holding Capacity
Plot 2	15.17	6.15	70.00
Plot 18	11.57	6.12	82.00

It has been shown by several writers that prolonged cultivation without addition of fertilizers reduces the amount of humus, or at least depreciates its value in the soil. However, this reduction does

not take place so rapidly as might be imagined. Virgin soils in many cases, contain a less amount of humus than those that have been cropped for several years. This is particularly true of soils that have been properly handled. In fact, in all our work on the Red River valley soils we invariably find more humus in those that have been cultivated for from five to ten years. The above table verifies this statement. On the other hand, while the virgin soil contains less humus, it invariably has a greater water holding capacity, a larger per cent of organic matter and more hygroscopic moisture. The organic matter, when the soil is cultivated, may increase the amount of humus. It is in these characteristics that the power lies to produce a crop in a dry season, when the long cultivated soil practically fails. During the year 1900, virgin soils and rotated soils produced an abundant yield of wheat, while soils such as 2 and A were failures; yet both these soils are extremely rich in plant food. They contain as much or more humus, but their physical characters are changed and they are "wheat sick." Just what these changes embrace, and what their relation is to the available plant food, is a matter yet to be determined.

The following table gives the total volatile matter in air dried samples, and also the moisture given off on drying at 100 degrees Centigrade.

TABLE II.

Sample Soil	Total Volatile Matter	Per Cent Given Off at 100 Deg.
Virgin soil, first six inches	26.20	8.90
Virgin soil, second six inches	15.96	5.30
Plot 2, first six inches	21.35	6.27
Plot 2, second six inches	8.75	6.16
Plot A, first six inches	18.65	4.98
Plot A, second six inches	16.45	4.98
Plot 2, first ten inches	18.97	4.73
Plot 18, first ten inches	23.46	4.08

As stated above, virgin soils with ordinary cultivation, at least those in the Red River valley, for a few years increase slightly in the amount of humus they contain. Those rotated properly, and especially those upon which some leguminous crop occasionally grows, will considerably increase the amount of humus and also the water holding capacity. However, with ordinary cultivation, it is generally conceded that there is a decrease in the amount. This decrease will be noticeable in the different regions at different times from the beginning of cultivation, depending upon the original humic contents of the soil. It could not be expected that soils as rich as those of the Red River valley would show a decrease as early as those of a region that originally contained but half their wealth and crop producing power. Yet with all their apparent richness, and with a great per cent of humus, soils 2 and A were practical failures in the year 1900, while virgin soil and those properly rotated yielded

fair crops. This leads us to believe that virgin humus and humus from long cultivated soils are not entirely the same, and do not hold the same relation to the mineral nutrients of the soil. Roberts says: "When the humus is taken out of native soils during the process of analysis, from .06 to .08 per cent of the phosphoric acid is soluble and associated with it, while only about .02 per cent is in this with the long cultivated soils. In some parts of the country this estimate is undoubtedly correct, but in the Red River valley, where the soil contains more of the plant food than is found in any other country, we find the estimate very low. In plot 2, in an amount of extract corresponding to two grams of soil, we found the merest trace of phosphoric acid, while some well cultivated ran as high as .12 per cent, or about 50 per cent of the total phosphoric acid in the soil. Bulletin 24: "There is a good supply of phosphates in all of these soils, but we must keep up the supply of humus to keep the phosphates available, etc. It will thus be seen that the great value of humus resides not only in its increasing the moisture holding capacity of the land, but in its power of liberating phosphoric acid."

While the functions of all the mineral nutrients of the plants are important and necessary to growth and fruitage, potassium, phosphorus and nitrogen may be ranked as first, not because plants require these any more than they do a certain amount of iron, calcium or magnesium, but because they are drawn upon most largely in proportion to the amount of them that is found in the soil, and they are most liable to be exhausted. Cooke says that "potash is to the plant what milk is to the child." Considering it in this light we can gain an idea of its importance. If, for any reason, the plant is deprived of a sufficient supply of potassium, it cannot be expected to assimilate the phosphorus, calcium, etc., in later life necessary for the formation of the seed or brain.

Phosphorus is especially necessary for the formation of lecithin and the nucleo-proteids. Both of these are found in the protoplasm of cereals, and, to a considerable extent, determine their value as a food. It is taken up in the form of phosphates, and is always found in relation with living protoplasm. Though the significance of this fact is unknown, its presence is considered essential to the complete development of the plant by cell division. Many soils, and especially Red River valley soils, contain enough phosphoric acid for generations to come, if properly cared for. The question is how to keep a suitable amount in available form. As it exists in the soil, it is partly in a soluble or available form, and partly in an insoluble or unavailable form. The first only is directly assimilable, and hence of use to plants. Again, after we have a sufficient supply of available acid, by poorer methods of cultivation and the absence of organic matter and lime, it may again be reverted to the unavailable form. It is found in the soil mostly in combination with the bases lime, magnesium, iron and alumina, and for the most part insoluble in water. All, with the exception of aluminum compounds, are ren-

dered soluble by the action of the carbonic acid water found in the soil. Knowing, then, that we have a good supply of phosphorus in the soil, the aim should be to retain as much of it in an available form as is necessary for the growing crop, without endangering a needless waste.

POTASH IN THE SOIL AND IN HUMUS.

The amount of potash in combination with humus is very much greater than the amount of phosphoric acid. The amount in numbers 2 and 18 was:

Plot No. 2	0.30 per cent
Plot No. 18	0.50 per cent

Nitrogen, the third member of the "essential three," is required by all green plants and especially by those rich in protein substances. But for the complete, healthy and normal development of the plant, potassium and phosphorus must be in conjunction with it. Nitrogen is believed to be taken up mainly in the form of nitrates; and as all nitrates are very soluble and easily washed away, the value of humus in the soil is readily seen. As shown in the table above, the water holding capacity of a solid depends, in a great measure, upon the humus, though it may vary slightly with the form of the humus.

That the nitrogen is held in a different combination in well cultivated and in poorly cultivated soils cannot be doubted. Though the amount of humus in number 2 and number 18 may in itself show nothing, the element it contains shows that it is much deteriorated in number 2. In fact it may be compared with wheat of different grades. There may be just as much of the poor one, but its value is much less. In a potassium extract, we found in humus, in terms of soil, of number 2 contained 0.14 per cent nitrogen, while number 18 contained 0.32 per cent. The difference in the two is more than many arable soils contain.

The portion of the rainfall in excess of the amount necessary to saturate a soil, not lost by evaporation, must percolate into the subsoil and hence carry a portion of the nitrates down with it. If, however, there is an amount of humus sufficient to hold the rainfall, within the first foot or so of the soil, this waste by leaching is prevented, and at the same time all the soluble nitrogen held within reach of the plant. A determination of the quantity of nitrates in the soil shows this to be a fact. (Bull. p. 47.) The same is true of potash and phosphoric acid. The following table gives the amount of these substances in the soils under consideration:

TABLE III.

Sample Soil	Per Cent Phosphor. Acid P_2O_5	Per Cent Potash K_2O	Per Cent Nitrogen N
Virgin sod, first six inches	0.35	0.58	0.51
Virgin sod, second six inches	0.28	0.49	0.30
Pot 2, first six inches	0.30	0.51	0.42
Plot 2, second six inches	0.30	0.46	0.28
Plot A, first six inches	0.29	0.52	0.42
Plot A, second six inches	0.22	0.50	0.25

Considering the fact that twenty-two crops have been removed from 2 and A, and that these soils, at least in unfavorable climatic conditions, give very inferior returns, we would naturally infer that some plant food was wanting.

An examination of the above table shows that there is still a great abundance of the three elements mentioned. There has not been so much of them removed as we might have anticipated; but what amount of them is available in the virgin and cultivated states we have not yet determined. That there is an abundance of all other elements can be seen in Table IV, which gives a fuller analysis.

TABLE IV.

	Virgin Soil		Plot II		Plot A	
	1st 6 in.	2d 6 in.	1st 6 in.	2d 6 in.	1st 6 in.	2d 6 in.
Silica, SiO_2	62.01	70.05	65.18	67.65	67.80	69.52
Lime, CaO	0.98	0.77	0.74	0.88	0.99	0.65
Magnesia, MgO	0.11	0.07	0.08	0.06	0.16	0.11
Aluminum, Al_2O_3	5.53	7.26	6.59	7.26	10.16	12.37
Iron, Fe_2O_3	3.40	4.12	3.66	4.03		
Phosphoric acid, P_2O_5	0.35	0.28	0.30	0.30	0.29	0.22
Sulphurous acid, SO_3	0.09	0.12	0.09	0.09	0.10	0.12
Potash, K_2O	0.58	0.49	0.51	0.46	0.52	0.50
Soda, Na_2O	0.59	0.28	0.58	0.28	0.21	0.20
Volatile matter and carbon dioxide	26.20	15.96	21.35	18.75	18.65	16.45
Total	99.84	99.40	99.08	99.76	98.88	100.14

There is an abundance of plant food in all these "wheat sick" soils as is clearly demonstrated by growing corn, potato or leguminous crops on them without the addition of a fertilizer. Afterwards, for several years, they will continue to produce remarkably good crops of wheat. In fact, experiments at this Station have shown that if we are to grow four crops of wheat after a number of years continuous wheat, we can get a great number of bushels if instead of four wheat crops we plant one leguminous crop and follow by three of wheat. Just what change takes place in the humus under these conditions is not known. However, we do know that in vir-

gin and in properly rotated soils there is a very much greater amount of phosphoric acid, potash and nitrogen in combination with humus than in the long cultivated ones.

Another point we must remember: For a good crop in this region nature requires a larger stock of reserve material than in regions where the rainfall is twice as large. To hold this reserve material in proper relation to the available material, a certain amount of humus is necessary.

After washing the soil with dilute acid and extracting the humus with a 40 per cent solution of ammonia, we have the humus extract. From this extract we can precipitate a number of humate compounds with hydrochloric acid. By neutralizing or acidifying we get the total precipitate, but at all points before reaching the acid condition we get a precipitate. In some of the work we add just enough of the acid to neutralize one-half of the ammonia solution and filtered off precipitate, and find that, just as heat and cold change the quality of humus, so solvents will likewise change it. If we allow an extract of it to stand for any length of time, a fine silty deposit gathers on the bottom of the vessel. This amount will be different for the various soils. After standing for several months the addition of the acid will give a much larger precipitate than when the extract is freshly prepared. For instance, after this length of time, on adding enough acid to half neutralize the solution we obtained the following results:

Plot	Humates Per Cent	Humus Per Cent
No. 2	11.78	3.27
No. 18	4.87	1.55
Freshly prepared—		
No. 2	2.54	1.43
No. 18	4.23 (?)	1.99 (?)

From all observations we find that number 18 is much more stable in character than number 2.

WATER HOLDING CAPACITY OF HUMUS.

The fresh humate precipitate has a remarkable water holding capacity. This capacity differs in the alkaline (in this work the precipitate obtained by half neutralization) and acid precipitates. From seven widely different determinations we get the following results:

WATER HOLDING CAPACITY.

Alkaline humus	1,100 per cent
Acid humus	940 per cent

From the amount of humates in the soil, these figures necessitate the holding of a larger amount of water when separated from, than when in combination with, the soil.

The alkaline precipitates also contain in most cases a greater amount of elements in combination. Following are the results:

TABLE V.

	Alkaline Humus	Acid Humus
Iron, Fe_2O_3	6.40	1.60
Alumina, Al_2O_3	0.76	0.72
Potash, K_2O	0.76	0.50
Acid phosphorus, P_2O_5	1.38	1.46

In the case of phosphoric acid the result is to be doubted. Observations lead us to believe that the alkaline precipitates contain the greater amount. From work now in process, we hope to gain a better knowledge of humus, its changes, combinations and relations to the available plant food and maintenance of soil fertility.

WHEAT BRAN AND SHORTS.

From the Milnor Milling Company was received a quantity of bran and shorts produced from Aronatka or Macaroni wheat. These feed products were analyzed and the results are given in the following table:

	Aronatka or Macaroni Bran	Shorts
Water	10.90	10.35
Ash	5.25	4.14
Fat	5.92	5.90
Crude fibre	10.80	6.05
Proteids	12.25	14.37
Nitrogen free extract	54.88	59.19
Total	100.00	100.00

The question was asked: "How do these products compare in food value with the products from spring wheat?" For comparison we give the analysis of spring wheat bran and shorts as follows:

	Wheat Bran	Shorts
Water	11.50	11.80
Ash	5.40	4.60
Fat	4.50	4.50
Crude fibre	8.00	7.40
Proteids	16.10	14.90
Nitrogen free extract	54.50	56.80
Total	100.00	100.00

From the above it will be seen that the bran from spring wheat is richer in proteids than that from the Macaroni, while the shorts have about the same amount of proteid.

A peculiar feature is the fact that, while wheat bran usually contains about 2 per cent more of proteid than the shorts, in this case the bran has 2 per cent less of proteid than the shorts, or nearly 4 per cent less of proteid than the average for spring wheat brans. The Aronatka bran contains 1½ per cent more fat than the average for ordinary spring wheat bran. Other samples of these mill products will be examined and a further study made of the flour products from Macaroni wheat.

STOCK FOOD.

A sample of International Stock Food was sent in by Hon. A. H. Laughlin, Lisbon, N. D., and found to have the following composition:

	Per Cent
Water	5.93
Ash	17.51
Fat	5.18
Crude fibre	9.36
Proteids, Nx6.25	14.81
Nitrogen free extract	47.21
Total	100.00

This sample was found to contain 6 per cent of sodium chloride (salt), and to contain considerable charcoal, pepper (presumably cayenne), and a bitter principle resembling gentian.

The basis of this product seemed to be a waste product from some flour mill, and its composition showed it to correspond very closely with bran.

The stock foods are usually sold at fabulous prices when we consider the food value contained in them. If we are to consider them in the light of medicines, the question may be fairly asked whether it would not be found more economical to purchase charcoal, salt, cayenne pepper, gentian, fenugreek, etc., to be fed animals where such products are needed. The entire food products cost from eight to twenty-five cents per pound, or from $160 to $500 per ton, when purchased in this form. The same amount of food material could have been purchased in the form of wheat bran or linseed meal at from $15 to $22 per ton. Certainly pretty expensive for the usual medicinal constituents contained in one ton of these foods.

Like the bitters sold for human consumption, these foods are claimed to be a panacea for all the ills of animals.

Such claims do not seem to be based on facts, judged from the experiments which have been made with them by careful investigators.

Well animals do not need medicine, and to stimulate the activity of one set of organs by means of drugs will usually result in functional derangement.

The cost of nutrients in these foods is excessive. Animals, if sick, should be treated for a specific purpose and by one competent to judge of their ailment.

PRAIRIE GRASSES.

Four samples of native grasses, gathered on the ranges in the western part of the state, have been analyzed for water free substance; also a sample of flax shrive from one of the flax mills.

	Ash	Fat	Crude Fibre	Proteids	Nitrogen Free Extract
Buffalo grass	10.30	3.74	23.20	5.81	56.95
Blue gama grass	.....	2.96	27.85	8.44	.....
Quack grass	9.41	4.50	25.93	16.12	44.04
Sand grass	5.13	2.13	33.46	9.06	50.22
Flax shive	4.37	3.46	47.47	5.62	39.08

EXCELSIOR FEED.

Two samples of Excelsior feed have been examined. This feed is produced by the Great Western Cereal Co., Chicago. The feed laid down in Fargo, sacked, cost $16.80 per ton.

Sample No. 1 was taken from the agent's selling sample.

Sample No. 2 represents the composition of the Excelsior feed furnished by the company. The analysis was for the water free substance, but the actual water content was found to be 7.42 per cent.

ANALYSIS OF EXCELSIOR FEED.

	No. 1	No. 2
Ash	3.78	4.24
Fat	5.82	4.83
Proteids	11.25	9.75
Crude fibre	10.45	15.48
Nitrogen free extract	68.70	65.70
Total	100.00	100.00

There is quite a marked difference in composition between the agent's selling sample and that shipped by the company, the agent's sample containing 1 per cent more fat, 1½ per cent more proteids or nitrogenous matter, and 5 per cent less of crude fibre than the food furnished.

The feed did not prove palatable to the cows, and only when mixed with other grain feed could they be induced to eat it.

THE STRENGTH OF COMMERCIAL FORMALDEHYDE.

During the past year there was considerable complaint that the formaldehyde that was being sold in various parts of the state was not always of the required strength. Several samples were sent in

from different parts of the state for analysis, and in some cases it was found that, as claimed, the chemical was much below the strength which it should have.

Below we give the results of a few analyses:

ANALYSES OF FORMALDEHYDE.

Sample from—	Formaldehyde—per cent
Noyes Brothers & Cutler, St. Paul	36.92
S. E. Garry, Knox	26.27 (bulk)
C. R. Merideth, Casselton	36.37
R. F. Mackall, Moorehead	27.72 (bulk)
J. S. Whitcomb, Casselton	31.98
Dr. Geo. Leininger, Chicago	37.75
J. S. Whitcomb, Casselton	28.90 (bulk)
Noyes Brothers & Cutler, St. Paul	34.76
C. R. Merideth, Casselton	36.25
Noyes Brothers & Cutler, St. Paul	38.21
Klipstein & Co.	35.78
Noyes Brothers & Cutler, St. Paul	34.20
Chas. W. Plains, Milton	42.37
Leithhead Drug Co.	40.40
Noyes Brothers & Cutler, St. Paul	40.17
H. E. Close, Milton	38.93
Geo. Draper, Osnabrook	40.56
Noyes Brothers & Cutler, St. Paul	40.17
R. H. Watson, Willow City	39.50

From the above analyses it will be seen that there is coming into the market formaldehyde, usually in carboys, and, so far as reported, all emanating from a single Chicago house, which falls far below the standard strength of 40 per cent. This is a matter of great importance, for farmers who use a formaldehyde containing from 26 to 27 per cent in place of 40 per cent solution for killing wheat smut will most certainly find the process a failure. To what extent this low grade formaldehyde occurs in the state I do not know, but farmers have complained that the treating of wheat, to destroy smut, had in their hands proved a failure. Is it not likely that the fault, in part at least, may be due to using a product such as I have mentioned?

SELECTING WHEATS FOR HIGH PROTEIDS AND GLUTEN.

In 1900, in co-operation with Professor Shepperd of the Department of Agriculture, we began the selection of wheats from individual heads to determine what could be done in the way of increasing the per cent of proteids, or whether wheats with high proteids would continue to propagate this fixed property from year to year. At first a large number of samples were selected, but gradually these have been reduced in number as the results indicated that the tested samples did not continue to propagate with uniformly high proteid content.

At the present time but eight samples are under experiment, and these have been grown for four years with results as shown in the following table:

Sample No.	Plant No.	Crop 1900		Crop 1901		Crop 1902		Crop 1903	
		Ni.	Pro.	Ni.	Pro.	Ni.	Pro.	Ni.	Pro.
107	65C	2.09	13.16	3.61	22.74	2.83	17.68	2.75	17.19
108	58B	2.97	18.56	3.37	21.06	3.03	18.94	2.48	15.50
113	36A	2.42	15.13	3.78	23 62	2.76	17.25	2.58	16.13
114	36B	2.42	15.13	4.24	26.50	2.82	17.65	2.62	16.38
112	15C	2.54	15.88	3.55	22.19	3 12	19.50	2.53	15.81
111	68A	2.75	17.18	3.25	20.31	2.94	18.31	2.57	16.06
109	55A	2.56	16.00	3.10	19.37	2.78	17.37	2.67	16.69
110	55D	2.45	15.31	3.19	19.93	3.34	20.87	2.52	15.75

It will be observed from the preceding table that the several wheats have not all continued to increase in proteid content, in fact, in some cases the crop for 1903 shows a lower nitrogen content than that for 1900. We should not, however, interpret the results too closely, since the character of the season has much to do in determining the proteid content of wheat. In 1901, the season being unfavorable to full maturity, the proteid content ran exceptionally high for all of the samples. It is proposed to continue this experiment for a few years from the selected seed. Each season from the seed of the preceding year the grain is being grown in quantity, so that of each selection we now have enough wheat for a further study to determine the gluten content and the character of the constituents constituting the gluten. The result of these tests will be given with a forthcoming report, and will form the basis for selecting the seed most promising for growth in larger quantity.

CORN FODDER.

Corns were grown in 1903, planted at different thickness, and the resulting crop analyzed. The following description applies to the method of growing:

No. 146. Corn grown in drills forty-four inches apart, and in hills from two to three feet in the drills.

No. 144. Corn grown in drills thirty inches apart, and in drills six inches.

No. 140. Corn sown in drills six inches apart.

The following table shows the analytical result for crops of 1903 in comparison with that of 1901:

	No. 146		No. 144		No. 140	
	1901	1903	1901	1903	1901	1903
Ash	5.87	6.80	5.82	6.93	5.93	7.83
Fat	2.89	2.52	4.32	2.95	3.49	2.95
Crude fibre	27.39	24.54	26.16	22.80	27.82	26.72
Proteids	8.31	6.81	8.50	7.18	8.75	5.25
Nitrogenous free extract	55.54	59.33	55.20	60.04	54.01	57.25

The crop of 1903 was badly moulded in curing, the season being unfavorable for harvesting corn.

CORN SELECTED FOR HIGH PROTEIDS.

In 1901, from the corn crop of that season, Mr. Schollander selected by physical examination several lots of corn for high proteids. The analyses of these samples was published in the Thirteenth Annual Report. Below we give the comparative results for the three years. In a few instances the crop of 1902 was not analyzed. In the last column is given the analyses for the crop of 1902, taking two rows the full length of the ears in place of a portion from the mixed and shelled sample of corn.

PER CENT TOTAL PROTEIDS.

Sample No.	Crop 1901	Crop 1902	Crop 1903	Two Rows Per Ear
123	14.00	14.00	12.37	13.13
124	13.13	14.00	13.31	15.06
125	13.44	14.00	13.06	15.75
126	13.88	14.87	14.50	12.25
127	15.44	15.44	12.93	15.44
128	15.31	14.31	14.50	15.06
129	13.69	14.00	12.63	11.06
130	13.31	14.00	15.93	10.69
131	13.56	14.00	15.37	13.81
132	13.13	15.75	13.81	10.69
133	13.13	12.93	13.63	11.88
134	13.56	14.68	12.06	14.00
135	11.69	.....	12.75	12.06
136	13.00	.....	12.63	12.81
137	13.31	.....	15.68	10.50
138	11.56	.....	10.13	11.00
139	14.00	.....	12.94	.....

The last row compared with 1902 shows some marked differences notably in No. 132, but in each case later anaylses confirmed the first

finding. It will be observed that samples No. 130 and 131 show a high proteid content, and the increase has been uniform for each year.

COMPOSITE SAMPLES.

To further test the results, ten ears were selected from each of a few lots to determine what variations would be found in larger quantities grown from the same seed in 1902. The results are given below:

Laboratory Number	Composite Sample Proteids
134	13.31
135	12.62
136	11.56
137	11.93
138	12.43

The work of selecting and breeding for high proteid content is to be continued and extended to field work.

ANALYSIS OF INDIVIDUAL STALKS OF CORN.

In the experiments in selecting corn for high proteid content, the seed to be used in developing corn with fixed proteids of per cent, it seemed well to determine what effect, if any, there might be upon different parts of the plant aside from the kernel. To that end a large number of fairly full analyses have been made of the corn plant, of the cob and of the kernels. These results are presented in the following table, expressed as water free substance:

Laboratory No.	Plant		Ash	Fat	Proteids	Crude Fibre	Nitrogen Free Extract
314	10	Stalk	6.40	2.87	6.81	29.58	54.34
314	10	Cob	2.10	.70	3.68	35.00	58.43
314	10	Kernel	2.19	3.07	14.87	3.16	76.71
315	24	Stalk	7.03	2.10	8.31	28.30	54.26
315	24	Cob	1.56	.31	2.13	35.59	60.41
315	24	Kernel	2.12	3.46	15.75	3.14	75.53
316	3	Stalk	7.67	2.76	7.56	28.88	53.13
316	3	Cob	1.66	.47	3.00	36.62	58.25
316	3	Kernel	2.00	3.46	14.00	2.80	77.74
318	25	Stalk	7.41	2.79	7.18	28.58	54.04
318	25	Cob	1.72	.46	2.37	39.18	56.27
318	25	Kernel	2.12	3.63	12.93	2.70	78.62
321	7	Stalk	7.68	1.94	8.44	29.38	52.56
321	7	Cob	1.55	.43	1.06	35.53	61.43
321	7	Kernel	2.22	2.98	13.31	3.70	77.79
323	16	Stalk	7.24	2.87	8.00	30.47	51.40
323	16	Cob	1.80	.59	2.43	38.73	56.45
323	16	Kernel	1.93	2.90	14.00	2.56	78.61
328	26	Stalk	7.44	3.34	7.00	27.36	54.86
328	26	Cob	2.24	.83	4.18	32.42	60.33
328	26	Kernel	2.09	3.57	14.68	3.07	76.59
331	17	Stalk	7.97	2.68	9.56	28.80	50.99
331	17	Cob	2.43	.60	4.06	35.13	57.78
331	17	Kernel	2.18	3.15	13.63	3.09	77.95
332	18	Stalk	6.80	2.60	8.37	29.78	52.45
332	18	Cob	1.93	.70	2.25	34.85	60.27

ANALYSIS OF INDIVIDUAL STALKS OF CORN—CONTINUED.

Laboratory No.	Plant		Ash	Fat	Proteids	Crude Fibre	Nitrogen Free Extract
332	18	Kernel	1.99	3.36	14.00	2.85	77.80
337	22	Stalk	6.59	2.58	8.56	30.37	51.90
337	22	Cob	1.56	.56	3.68	39.70	54.50
337	22	Kernel	2.06	3.95	14.00	2.94	77.05
338	11	Stalk	6.35	2.19	10.50	29.89	51.07
338	11	Cob	2.15	.68	4.18	34.66	58.33
338	11	Kernel	2.09	3.18	15.75	3.07	75.91
342	1	Stalk	7.38	2.63	8.69	27.25	54.05
342	1	Cob	....	....	.....	.....	.....
342	1	Kernel	....	....	.....	.....	.....
343	9	Stalk	7.05	2.71	9.62	27.81	52.81
343	9	Cob	1.68	.53	3.13	36.21	58.45
343	9	Kernel	2.19	3.74	14.00	2.58	77.49
344	4	Stalk	6.66	2.69	7.68	28.25	54.72
344	4	Cob	1.90	.53	2.12	36.74	58.71
344	4	Kernel	2.14	3.58	14.00	2.85	77.43
345	15	Stalk	6.48	2.97	8.94	29.51	52.10
345	15	Cob	1.60	.48	3.00	34.86	60.06
345	15	Kernel	2.17	3.78	14.31	2.58	77.16
346	6	Stalk	6.93	2.79	9.75	29.05	51.48
346	6	Cob	2.19	.67	3.18	34.73	59.23
346	6	Kernel	2.00	3.71	13.25	2.96	78.08
347	5	Stalk	7.45	2.79	9.93	34.16	45.67
347	5	Cob	1.88	.41	2.25	34.50	60.96
347	5	Kernel	2.08	3.48	14.00	2.88	77.56

CORN PLANTED ON DIFFERENT DATES.

For several years it has been the custom of the Agricultural Department to grow corn planted on different dates, to determine the yield and influence on problems connected with soil fertility. In 1901 and again in 1903 corn grown under these conditions was analyzed, taken from the field crop planted in drills six inches apart, also from drills forty-two inches apart. In the following table the results are given for the water free substance:

Planted	Year	Drill	Ash	Fat	Crude Fibre	Proteids N×6.25	Nitrogen Free Extract
June 8	1901	6 inch	8.12	3.20	29.12	7.19	42.80
June 8	1903	6 inch	7.45	2.69	24.10	7.00	58.76
June 8	1901	42 inch	7.03	5.30	27.80	8.69	51.18
June 8	1903	42 inch	9.67	2.46	25.40	6.00	56.47
June 15	1901	6 inch	8.84	3.80	28.66	8.19	50.51
June 15	1903	6 inch	9.50	2.77	26.12	3.68	57.93
June 15	1901	42 inch	.....	.....	.....	.....	.....
June 15	1903	42 inch	8.61	2.90	27.60	6.13	54.76
June 27	1901	6 inch	8.26	3.73	30.45	9.50	48.06
June 27	1903	6 inch	8.79	1.43	25.87	5.61	58.28
June 27	1901	42 inch	7.40	3.20	28.48	9.19	51.73
June 27	1903	42 inch	8.01	3.01	22.75	6.81	56.42
July 2	1901	6 inch	12.91	2.73	31.24	10.06	43.06
July 2	1903	6 inch	.....	.....	.....	.....	.....
July 2	1901	42 inch	11.42	2.77	32.94	10.94	41.97
July 2	1 903	42 inch	8.84	3.01	23.46	7.00	57.69

The crop for 1903 was badly cured, the fall being very unfavorable owing to the excessive rainfall and continuous cold, cloudy weather. In some instances nearly 90 per cent of the crop was found to be mouldy. This may account in some measure for the lack of uniformity in the data from the analyses.

RECOMMENDATIONS AND ACKNOWLEDGMENTS

For loyal and untiring support in the work of the Chemical Department I am greatly indebted to the assistants who have carefully performed the duties assigned them.

Adele Shepperd has continued to serve as Assistant Chemist in the Experiment Station for the past year, and a large share of the routine work of analysis has been done by her. I commend most cordially her faithfulness to the duties assigned to her care. I am also indebted to my assistant in the college for much analytical work during the past year. Mr. C. H. Kimberley has devoted much time during the past summer and fall to station work and I am indebted to him for much analytical data.

I desire to commend each of the assistants for the faithful performance of assigned duties.

I close my report with the statement made in submitting my last annual report.

"The one great need of the department at the present time is for rooms where chemical work can be expeditiously and safely performed without being disturbed by college exercises. The present quarters, poorly ventilated, overcrowded, improperly heated and often damp beneath the floor, are a menace to the health of all engaged in Station laboratory work."

Respectfully submitted,

E. F. LADD,

Chemist.

DEPARTMENT OF BOTANY.

To Director J. H. Worst:

SIR: The following is an outline of the work attempted under my direction in the Department of Botany during the year ended December 31, 1903. The year's efforts have been profitable in the fullest sense of the word, and I feel sure that the results obtained, and in part stated or indicated in this report, merit the close attention of the farmers of the state, indeed of every person interested in the application of botanical principles and methods of study to farm work.

CONDITION OF THE DEPARTMENT, ASSISTANTS AND EQUIPMENTS.

It is with a feeling of much gratification that I am able to state that the equipment and working force of the Department is in a most satisfactory condition. Under present conditions I feel sure that the Department will be able to make very rapid strides toward the accomplishment of the types of work that should be expected of it. The working force was placed upon an efficient basis by the return of Assistant Botanist L. R. Waldron from his leave of absence to attend Michigan University, where he took post graduate work of such nature as to fit especially himself for the duties assigned to him in the Department; and by the election of Mr. Thomas F. Manns to the position of second assistant. This places the working force, both as to teaching and Experiment Station work, upon an efficient basis. Previous to this year it had been the lot of the Department to have to train a new aid in the Station work each year, a policy which is very disadvantageous to sound advance in experimental work.

THE PLANT HOUSE—The inability of the institution to construct the buildings planned, again leaves us minus the much needed and often expected plant house for experimental work upon farm plants. However, we shall, as in the past, center our efforts upon such features of the work as may be accomplished with least detriment in the absence of such much needed appurtenances to any properly equipped botanical laboratory or experiment station for the study of plants.

In order that the labor in the Department may be systematized as fully as possible, the assistants have been assigned to definite fields of investigation, and along the lines of greatest efficiency. Mr. Waldron is in charge of those types of work directly concerned with the systematic phases of botany, including especial studies upon

weeds and forage plants and the preliminary work of constructing a garden of native plants. To Mr. Manns has been assigned supervision of the laboratory of bacteriology and special studies connected with the general field work of the Department upon plant diseases. I wish, here, to commend the efficient manner in which the different lines of investigation have been conducted during my absence. Preparatory to my leave of absence in Europe for the purpose of making a study of the conditions of flax culture in the different flax producing countries, certain definite lines of experiment were laid out to be continued here, and I find that the work has been carried out in a most satisfactory manner.

Flax Culture in Europe—Early in our investigations of the flax crop and its diseases it was seen that our studies would be greatly facilitated by a survey of the conditions of culture, and of the diseases which attack the crop in European flax areas, especially those of Russia and Holland. To this end the U. S. Department of Agriculture offered co-operative aid, and I was detailed for that work by our board of trustees. The work as undertaken was thus a joint one on the part of the United States Department of Agriculture and the North Dakota Experiment Station. The time occupied in this foreign study included the months of May to December inclusive. Much information was gained at first hand and numerous samples of seed were collected for future trial in the work of plant breeding.

The report of this work, by agreement, is first to be given to the Department of Agriculture. This will be of advantage because of the wider circulation possible to such publication. A report of the type desired is in course of construction. We have also begun arrangements for the proper testing of all seeds obtained in a careful, comparative manner. Only comparatively small samples of any selections of seed were brought over, but samples of these may be had by Experiment Station men, through application to the Bureau of Plant Industry at Washington, in sufficient quantities for studies in plant breeding and selection.

Tests of Native and Other Grasses—In the fall of 1902 this department and the Division of Agrostology of the U. S. Department of Agriculture planned to conduct some co-operative experiments upon the western plains of North Dakota, looking toward rejuvenation of the grazing lands of the state.

Owing to a failure of the state to provide funds for this work as planned in the agreement, the original co-operative plan was abandoned; but many seeds had already been forwarded by the Department of Agriculture for the work. These we were allowed to retain and were used in experimental trials here at Fargo; for which full records are kept upon the plans proposed by Prof. W. J. Spillman of the Department of Agriculture.

The seeds were sown in both large and small plots, under particularly favorable soil conditions. The small plots were given very

favorable hand preparation and seeding. The large plots were given exceptionally good field handling. These last plots approximated one-tenth acre in area.

The grass seed samples were generally in good condition when received, but some of them had been gathered two or more seasons. In nearly all such cases these aged seeds failed. The age of the seed was probably an important factor. A large number of the samples failed to grow. In many cases at least this was due to the long period of dry weather following seeding. Those that germinated and succeeded in growing did so under very adverse conditions, which was a good test of their value in this state. The following perennial species came up well and grew vigorously the entire season: Meadow fescue grass (*Festuca pratensis*), rough fescue grass (*Festuca scabrella*), western brome grass (*Bromus pumpellianus*), and short awned brome grass (*Bromus marginatus*). Samples of *Bromus inermis* and slender wheat grass which were planted grew and did well, though apparently not as well as the fescue grasses or the short awned brome grass. The stand of the fescue grasses at the end of the growing season was very heavy and fine. The condition of the brome grasses was also excellent. Of the annual grasses sown, Colorado grass (*Panicum Texanum*) and tall oat grass (*Arrenatherium elatius*) were the only ones that showed promise, but the dry condition of the season seemed to be against them. Work on the grasses will be continued, and it is hoped that work upon the selection and breeding of our native grasses can be undertaken.

H. L. BOLLEY,
L. R. WALDRON.

Study of Elevator Samples of Wheat—As there is a general complaint in regard to elevator grades and dockage, it was thought a good plan to obtain a number of elevator samples of grain and make a study of them. It was also desired to learn something further in regard to the distribution of weeds as determined by the weed seeds found to be present in the samples obtained from widely separate points in the state. To this end some fifty samples of wheat were obtained from different elevators. The purchasing grade and dockage was furnished in each case by the elevator agent.

In our studies the following points were determined as accurately as possible: The amount and percentage of foreign matter (dockage), the kinds and relative abundance of weed seeds, and the presence of smut balls. A certain amount of wheat was weighed out from the samples—about seven ounces—and by screening and hand picking the weed seed was entirely sorted out. This was weighed and by this means the real dockage was easily estimated. Forty-seven samples were studied, of which twenty-nine graded "one northern," thirteen "two northern," four "three northern," and one "rejected." The elevator dockages ran from one-half pound in a

single instance, up to two and one-half pounds in one case. There were more dockages at one pound than at any other figure. There were but two samples that were docked less than one pound. When the real dockages are compared with the elevator dockages, a marked difference is at once apparent. In only four cases is the elevator dockage less than the real dockage. In the remaining samples the elevator dockage was always too much, and in many cases the difference was very marked. In one sample which the elevator docked one pound the real dockage was found to be only .06 of a pound. This would be a loss of about eighty bushels on 5,000 bushels. The elevator dockage on all the samples averaged 1.26 pounds. The real dockage averaged .64 pounds, leaving a difference against the farmer of .62 pounds per bushel. Considering these figures as an average for the state, such dockage would entail a loss to the farmers of about 400,000 bushels of grain in one season. One sample which was docked two and one-half pounds contained more than eight pounds of foreign matter per bushel. In all cases in which the elevator dockage was too low the wheat was very dirty. According to samples examined, the elevators not only dock too heavily, but they dock unjustly. The cleanest wheat received proportionately, the greatest dockage, while the dirtiest wheat received, proportionately, the least dockage.

In regard to weed seeds, among the many kinds found, there were two kinds invariably present, wild buckwheat and pigweed or lamb's quarters. Russian pigweed seed (see bulletin No. 56, page 218) was found in wheat from Benson and Ramsey counties. Before this this very bad species of weed had been found only in Pembina and Cavalier counties.

Sixty-six per cent of the wheat samples contained smut balls. This would seem to indicate a certain amount of carelessness in treating seed grain, for it is well known that wheat treated with one pound of standard formaldehyde to forty-five gallons of water will prevent smut from appearing in the crop. The seed grain should be thus treated every year. If the wheat over the state was as much smutted as these samples seem to indicate, it means a greater loss to the farmer than unfair dockage.

L. R. WALDRON.

This definite test by Mr. Waldron of the quality of grain received at the elevators is directly in line with much work previously done at the Station, and is largely substantiated by our former studies. It is preliminary work of much importance and calls for close consideration. Certain it is that the balance indicated as in favor of the elevators is upon the side upon which one should expect to find it. It would be extremely bad policy for grain buyers to allow the differential to be always on the other side. It would mean a money loss to them, and would furnish a constant bonus for a careless, weed producing agriculture. The other point, however, which shows that

the dockage is quite uniformly too low in the case of poor, dirty wheat, is really the most serious matter. It will be a bad day for American grain interests when our farmers shall generally conclude that it does not pay to put well cleaned grain upon the market. It is then but a short step to the mind status of the Russian peasant, who sees no moral impropriety in the addition of a choice assortment of weed seeds, sticks, dirt and gravel.

I have always found our chief elevator grain men serious in their desires for the constant improvement of the quality of the farm output. This work merits fuller investigation on a more extended plan, and we hope to be able to continue it.

The Adulteration of Formaldehyde and the Formaldehyde Treatment of Seed Grains—This Station originated and introduced the formaldehyde treatment of seed grains for the prevention of smuts in cereals, and it has been found entirely successful for that purpose, when used in the strength recommended. It has also been found to be thoroughly beneficial to the growth of the plants from the seed, by acting as a check upon mould fungi, bacteria and various agents of decay, which otherwise prevent the young plants from drawing the full supply of nourishment from the mother seeds.

As indicated in the report of Mr. Waldron upon the examination of elevator samples of wheat, there was much smut in this state again this year.

In part this can be explained by a certain number of those who have usually treated failing to do so, thinking their wheat clean. This can never be entirely true. Smut will creep into the crop by means of incomplete treatment, sacks, threshing machines, drills, etc., and though not apparent in the seed, may be there in sufficient quantity to produce a great growth of smut during a favorable season. Also many of the farmers just come to the state are ignorant of the necessity for treating seed grain. Every farmer should take it upon himself to educate his neighbor upon these simple truths. No farmer can afford to allow his neighbor to grow disease bearing crops if, by a little advice, the disease can be done away with.

However, the most serious matter comes to our knowledge in the fact that farmers who have always successfully treated their seed grain, complain of failure; and upon investigation it is found that the druggists have sold, intentionally or otherwise, a low grade of formaldehyde, sometimes of less than half strength. I have called attention to this matter before. It is one of vital importance to our farmers. They ought to be protected. Our farmers should join with the sick in demanding that a sound law be passed making it a criminal offense to place any but pure, standard chemicals and drugs upon the market. In regard to formaldehyde, it should be specified that it shall not only be of pure quality but of stated strength. It is the intention of this Station to assist the farmer in this matter, and any firm which places low grade formaldehyde upon

the market as standard may expect to get some very hard advertising therefrom. Any farmer having cause to doubt the quality of the formaldehyde sold to him should confer with the Chemical Department of this institution.

My present advice to farmers is to buy only from standard drug houses. Do not insist upon a low price formaldehyde or take chances on the man who can sell something "much cheaper" than reputable or well known firms. Ask always for standard strength, 40 per cent formaldehyde. Don't buy it unless it has some reliable firm's name attached to the container. A farmer who has smut in his seed grain can well afford to pay well for the very best formaldehyde, but will lose heavily on his crop if he buys an inferior article.

WEEDS AND FORAGE CONDITIONS—During the early spring two important circulars were sent out, asking set questions to be answered by farmers and stock growers especially interested. It was believed that the answers obtained would help materially in formulating plans to aid in the elimination of weed pests and to help or better the grazing conditions of the state.

Circular No. 1 sent out by Mr. Waldron, read as follows:

It is the intention of this Station to undertake a study of the range problems of this state. The present conditions of the range, the causes which have brought about their depletion and methods by which they may be brought to their former standard. In order to do this it is desirable to co-operate as far as possible with the various ranchmen of the state, and to that end the enclosed questions are sent you. Answers to these will put us in closer touch with the actual condition of affairs.

It is a well known fact that the grazing lands of North Dakota have been and are being greatly lessened in extent by the great increase of cultivated areas. As the grazing lands are decreased in acreage there is a natural tendency to overstock the remaining ranges, and thereby decrease their carrying capacity. It is believed that if the ranges that remain are properly handled they will regain their former efficiency, or even be increased in quality. It is desired that the enclosed questions receive careful consideration at your hands, and if you can give us further information along the same lines it will be deemed a favor.

QUESTIONS.

1. How long have you lived upon the range, and how much range land have you a knowledge of?
2. What is the average carrying capacity per square mile of horses, cattle or sheep on the range in which you are interested?
3. Has the capacity to carry stock been diminished within your experience, and, if so, how much, and to what causes may such diminution be attributed?
4. Are the lands near you unsuitable for profitable cultivation? If so, is this due to lack of moisture, uneven ground, or what?
5. Has any of the land that you think unsuited for cultivation been broken for that purpose?
6. What effect does such breaking have upon the land for grazing purposes? Does it eventually become as good as before?
7. Have you any treatment to recommend for improvement of the ranges where they have been overstocked?

Many very good letters were received in answer, and the studies are continued. As this is a question which may be expected to grow

in importance, the Department will be pleased to have any farmer or stockman who reads this report give his opinion upon such of these questions as he may be particularly interested in, or upon which he can give some information.

CIRCULAR NO. 2.

This circular was sent out as "Special Bulletin No. 2, Weeds," by L. R. Waldron, to which was attached a detachable leaflet of questions.

This portion of the circular read as follows:

Please answer as completely as possible the questions on the annexed sheet and send it to the Botanist, Agricultural College, N. D.

Name .....

Postoffice .....

County .....

1. Name eight or ten of the worst weeds growing upon your farm or in your vicinity. (If the names are not known, the plant sent in will do as well.)

2. From observations made in your district, what per cent loss do you estimate is done annually to the crop by weeds?

3. Of the total loss to the crop from weeds, what per cent do you estimate is due to (a) the suffocation of the growing crop? (b) What is due to robbing the soil of plant food and moisture? (c) What loss is due to dirty and degraded grain?

4. What method do you use in the eradication of weeds? Have you any special methods for particular kinds?

Underline once the following plants that grow in your neighborhood, and underline twice the plants that are a serious pest to farming:

1. False flax.
2. Hare's ear mustard—black mustard.
3. Tumbling mustard.
4. Pink cockle.
5. Water hemlock.
6. Kinghead.
7. Canada thistle.
8. Wild lettuce.
9. Russian thistle.
10. Wild oats.
11. Quack grass.
12. Sunflowers.

This weed question also will not grow stale, and as we are particularly interested in keeping informed as to the distribution of destructive or detrimental weeds, the Department will be pleased at any time to assist the farmers of the state in becoming properly informed as to the nature of the weeds which trouble them.

If you desire information in regard to plants growing on your farm, write to us, or send in a specimen plant. In all cases when plants are sent in it is of direct help to us, for we learn when harmful plants are being introduced and the distribution of the ones already here. Send in the plant in an unsealed package with your name and address on the outside. The postage is one cent per ounce. In the accompanying letter give your opinion of its weedy or other properties, with other information you consider of interest.

AN OBJECT LESSON IN WEED SEEDS—Strange as it may seem to many, the farmers, the very persons who should know kinds of weed seeds do not generally know the plants upon which the com-

mon sorts of weed seeds which are found in grain, grow. To help them in this matter, Mr. Waldron, this season, prepared an authentic set of weed seed samples of twenty-six of the worst weeds. The seeds were enclosed in small bottles labeled with the proper name of the weeds, and all enclosed in a neat cloth bound case so that the seeds are ready for easy examination. With such a case before him a farmer can easily learn for himself the kind of weed seeds to be found in his grain.

The list of samples prepared was as follows: Quack grass, wild oats, cheat, pigeon grass, wild barley, wild buckwheat, Russian pigweed, lamb's quarters, Russian thistle, red-rooted pigweed, corn cockle, pink cockle, yellow mustard, Shepperd's purse, false flax, hare's ear mustard, peppergrass, ball mustard, tumbling mustard, pennycress, water hemlock, kinghead, Canada thistle, marsh elder, prickley lettuce, sunflowers. The set was sold to the farmers at the cost of preparation and was soon exhausted. Others will be prepared during the coming season.

The weed and native plant seed collection prepared for reference in the Department was increased during the year by many numbers.

The Agricultural Survey—The regular lines of investigations in connection with the agricultural survey have been advanced along previous lines, certain types of plants and certain definite areas being studied. Three short excursions were made for the purpose of studying stock poisoning plants. Mr. Waldron spent a week studying range conditions in Mercer county, especially along the Knife river; and further collections of native plants were made at Minot, Towner, Bottineau and Walhalla.

The Publications of the Year—Early in the year much work was given by the head of the Department to foreign correspondence and to the study of flax seed samples, samples of flax straw, etc., sent from foreign flax growing areas. This was a requisite step preliminary to the undertaking of the foreign investigations, thus making it possible to receive the necessary aid from the United States Department of Agriculture. This work proved very instructive, and a full report of the same was made to the head of the Bureau of Plant Industry. Later this will, in part, be embodied in the general report upon that work, and much of it may be used in our regular bulletins.

Of the regular publications, the following bulletins have been sent out: (1) Bulletin No. 55, "Flax and Flax Seed Selection," by H. L. Bolley, March, 1903; (2) Press Bulletin No. 2, "Seed Wheat," by H. L. Bolley, March, 1903; (3) Press Bulletin No. 3, "The Way to Avoid Flax-sick Soil—Select Seed," by H. L. Bolley; (4) Special Bulletin No. 2, "Weeds," by L. R. Waldron, May, 1903; (5) Press Bulletin No. 10, "Treat Your Seed Corn," by L. R. Waldron, May, 1903; (6) Bulletin No. 56, "Noxious Weeds and How to Kill Them," by L. R. Waldron, June, 1903; (7) Bulletin No. 58, "Some Stock Poisoning Plants of North Dakota," by L. Van Es and L. R. Wal-

dron, December, 1903. This last named bulletin was prepared in colaboration with Dr. Van Es of the Veterinary Department. In most cases the demand for the newspaper press bulletins continues after the issue is exhausted. If it is thought desirable, these will be collected and re-edited to form a composite bulletin of the regular issue. I deem it desirable to do this, also, as a matter of record of such press bulletin work in the Department.

THE WORK OF MR. THOMAS MANNS—The data for the report of the year upon the remaining subjects here reported upon are furnished from notes taken by Assistant Botanist Thomas Manns. The subjects under consideration arise from the continuation of regular lines of investigation planned and in part executed in previous years.

WILT CONTROL BY CROP ROTATION ON ROTATION PLOT NO. 30—This is the third season of this work. The crops used in previous years, methods of work and the observations made may be learned from the Thirteenth Annual Report, pages 34-36. The record of the year 1903 is as follows:

Bed No. 1. April 16th, sown with Kubanka wheat, ground not respaded. July 25th a heavy crop matured, strong, healthy and very regular.

Bed No. 2. April 16th, sown with a prairie mixture of grass. July 25th a nice, even, strong growth of grass.

Bed No. 3. Sown with brome grass, 1902. Brome grass second year. July 20th cut a heavy, thick crop of brome grass.

Bed No. 4. May 16th, sown with a mixture of forty samples of flax seed from different European countries. One half of the seed was treated with formaldehyde, three parts to 1,000; one-half not treated. July 31st, nearly all plants, whether from treated or untreated seed, died of wilt. Few plants showed immune qualities, but more resisted than in case of mixed American seeds in bed 5.

Bed No. 5. May 16th, sowed with mixed flax seed from a mixture of some sixty different American samples of seed obtained from various parts of the three northwestern states, one-half treated with three parts in 1,000 formaldehyde, and one-half not treated. July 25th, nearly all plants dead of wilt, both treated and untreated. Very few showed immune qualities.

Bed No. 6. May 16th, sowed Velvet Don wheat, ground not respaded. July 25th, a very heavy crop of wheat matured.

Bed No. 7. May 27th, sowed corn, yellow dent, fodder. This is the second year with corn. July 25th, corn over five feet high, a fine stand, ears plentiful and large. Not a single hill or plant died.

Bed No. 8. May 16th, fifty-seven individual European samples of flax seed were sown to test wilt resisting properties. Many samples, nearly 70 per cent, showed very little if any resisting qualities. None showed perfect immunity. About six samples showed 30 to 45 per cent or more of immune plants. About twelve samples showed from 5 to 15 per cent of immune plants.

Bed No. 9. May 22d, sowed south half with twenty-five American individual samples to test immune qualities. Practically all samples died, except a few in sample No. 72.

Bed No. 9. May 16th, sowed the north half of bed No. 9 as follows: Six rows with seed of the largest hand selects from flax seed grown upon rotation plot No. 31 in 1902, a diseased plot. Rest of bed was seeded to large, select seed from same source, selected by screen method. Object, to test immune qualities. Results, about 98 per cent wilted and 2 per cent matured seed.

Bed No. 10. May 29th, sowed south two-thirds of bed with seed from original immune selected plants. To test immune qualities, sowed checks with them. Conclusion: Nearly all of these original immune plants showed some immune qualities. Several showed almost perfect immunity, and matured an even and full crop. All checks died quickly. The third generation, grown from second generation of immune plants, matured in greenhouse in winter of 1902-1903, which were raised on this plot showed about same resistant qualities as did the second generation grown side by side on this same bed.

Bed No. 11. May 26th, planted the south half with largest screen selected flax seeds obtained from the diseased 1902 crop, from rotation plot No. 31, and the south half of the north half with the smallest screened selects from seed of same source as last, and the remainder of the north half with dark colored, dark pointed or "scaly" selects from seed of same source. Object: To test the immune characteristics of each. *Conclusions:* I estimated about 1-200 of largest selects were immune and matured seed, about one-fiftieth of the plants from the smallest selects matured seed, and of those from the "scaly" seeds about one-fortieth matured seeds.

Bed No. 12. This bed still remains idle as to cultivation. Practically, it has now almost reached native prairie form again, that is, the weeds and grasses which it produces are perennial.

The culture work when last taken on the different plots show that *Fusarium lini*, yet persists in all of the beds, perhaps in least abundance in bed 12.

The field experiments this summer on beds 4, 5, 8, 9 and 11 show that the soil is yet thoroughly infested with the wilt disease, and speaks badly against the hope that any short seried rotation will prove to be effective in ridding the soil of the parasite. There was no reliable evidence indicating that wilt infested soil was detrimental to the growth of the other farm crops tried. All crops grown in 1903, viz.: Macaroni wheat (two samples), corn, prairie grass and brome grass, all showed a fine growth, in no way being affected by the sick condition of the soil. Treating flax seed does not prevent the fungus (flax wilt parasite) which is in the soil from attacking the seed upon germination. The plants from common seed, whether from treated or untreated seed, died with equal speed.

In 1900, because of previous continuous cropping with flax, bed No. 10 was found to be unable longer to support common flax. This year, though it has been seeded continuously to flax since 1900, it was found to be able to furnish abundant nourishment to produce a strong growth of the flax from our select immune seed. This is the final proof that flax cropping, of itself, does not destroy the chemical fertility of the soil, or cause other mechanical or physical condition of the soil, accounting for flax failure in such soils. It is now quite demonstrated that the difficulty is alone due to the wilt fungi.

The Work Looking Toward Procuring Strains of Flax Seed Immune to the Wilt Disease or Diseases—(a) European mixed samples in bed No. 4 showed a much larger percentage of immune plants than the American mixed samples in bed No. 5. (b) European individual samples in bed No. 8 showed a much larger percentage of immune plants than the American individual samples in bed No. 9. This would seem to bear out the observations made in our laboratory and greenhouse studies of 1902, represented in the Thirteenth Annual Report, pages 55 and 56, where it was also suggested that it might yet be possible to find an immune variety or strain in considerable bulk. The large number of different samples selected while in Europe this summer will make it possible to test this subject thoroughly. (c) The seed from our original immune selected plants showed up exceedingly well, several showing almost complete immunity and producing fine crops, others showed only partial immunity. The checks all died, except one individual plant. The third generation, raised from greenhouse grown seed of immune selects, showed resisting qualities about the same as seen in the second generation from seed of field grown immunes. (d) Immune plants were in most cases attacked apparently as freely by rust (*Melampsora*) as common flax. (e) It seems probable that it may be possible to obtain, by selection, an immune strain from almost any general sample of flax seed.

In connection with the selection work, as practiced on a field plan, the work, as conducted on the diseased area known as rotation plot No. 31, gave good opportunity for observation. It is learned that this cannot be accomplished well unless some means is taken to hold the growth of the weeds in check. Left under ordinary field conditions, the surviving or resistant plants being few upon the ground, are soon overcome by the growth of weeds. The smaller select seeds and the more diseased and sickly looking seeds selected from the diseased crop of 1902 on rotation plot 31 showed a larger percentage of resistant plants than the selected best seed from same sample. (See, also, summary, bed No. 11, under wilt control by rotation work.)

In the study of the growths from the seed from individual select plants, it is interesting to note that all growths from the seed of such resistant plants, showed some powers of resistance. The check growths from common seed always died early, usually at from one to two and one-half inches in height, while those from the seeds

from the immune selects, which failed to mature seed, often reached heights varying from four to twenty inches before succumbing to the wilt. The following table will indicate the results obtained in this work with the seed from sixty mother plants (selects). The amount in grams shows the yield of seed, the number is the name of the mother plant:

No.	Crop.	No.	Crop.	No.	Crop.	No.	Crop.
1.	25 grams.	16.	.....	31.	.....	46.	17 grams.
2.	.....	17.	7 grams.	32.	29 grams.	47.	.....
3.	16 grams.	18.	45 grams.	33.	44 grams.	48.	40 grams.
4.	32 grams.	19.	.....	34.	5 grams.	49.	19 grams.
5.	62 grams.	20.	.....	35.	.....	50.	7 grams.
6.	.....	21.	46 grams.	36.	11 grams.	51.	7 grams.
7.	.....	22.	28 grams.	37.	.....	52.	47 grams.
8.	.....	23.	59 grams.	38.	.....	53.	42 grams.
9.	10 grams.	24.	.....	39.	15 grams.	54.	35 grams.
10.	72 grams.	25.	59 grams.	40.	27 grams.	55.	.....
11.	.....	26.	.....	41.	46 grams.	56.	7 grams.
12.	10½ grams.	27.	.....	42.	.....	57.	24 grams.
13.	62 grams.	28.	66 grams.	43.	.....	58.	24 grams.
14.	21 grams.	29.	.....	44.	21 grams.	59.	27 grams.
15.	.....	30.	49 grams.	45.	56 grams.	60.	14 grams.

Some sixty samples of flax seed were obtained from various flax growing districts of Europe. About one-fourth ounce of each kind of seed was sown upon wilt infected soil—one row sixteen feet long. The following table shows the number of individual European samples which showed resistant qualities and the amount of seed matured by each:

Sample No. 22 matured 96 grams of seed.
Sample No. 26 matured 11 grams of seed.
Sample No. 27 matured 39 grams of seed.
Sample No. 29 matured 46 grams of seed.
Sample No. 31 matured 52 grams of seed.
Sample No. 35b matured 30 grams of seed.
Sample No. 35g matured 16 grams of seed.
Sample No. 36 matured 29 grams of seed.
Sample No. 41 matured 27 grams of seed.
Sample No. 44 matured 24 grams of seed.
Sample No. 45 matured 31 grams of seed.
Sample No. 47 matured 21 grams of seed.
Sample No. 52 matured 99 grams of seed.
Sample No. 54 matured 112 grams of seed.
Sample No. 56 matured 80 grams of seed.

These strains will be tested again next season, and a full report upon origin of the seed and the character of the results may better be given in bulletin form.

We have also collected this year 759 grams of seed, matured upon a diseased area from a mixed lot of European grown seed.

By hand hoeing and weeding, enough plants matured in a field crop on rotation plot No. 31 to furnish one-half bushel of seed. This will be used again on the same diseased land next year.

In all, we thus have a good supply of seed for further work upon this question, and the results of our experiments have been such that there can now be no doubt that we shall ultimately be able to develop a wilt resisting strain of flax.

Frost Resistant Flax. Some of our observations in previous years led us to think that it might be possible to select a strain of flax which would have somewhat greater resistance to frost, both spring and fall, than that shown by the present common crop. An extended experiment was undertaken this past season. Thirteen plantings were made, beginning April 13th and ending July 20th, about one planting each week. Plantings were made each time from several different types of seed—mixed American seed, mixed European seed and numerous individual samples.

The season proved very unfavorable for a test of this work. The spring was backward and droughty, so that, excepting the first planting, all lay in the soil until spring frosts were past; that is, only the first planting was up so as to catch the spring frosts; hence on the spring frost selection all results had to come from this planting. The strongest frost was April 30th, when nearly all of the first plantings were up. The temperature registered 14 degrees Fahrenheit, making 18 degrees of frost. The frost resisting qualities of many of the strains appeared to be quite good. About two-fifths of the plants from the European mixed seed in planting No. 1 stood the above frosts. These plants were up one inch high and had only seed leaves at this freezing. A much less number of the American mixed flax stood the above frosts. By estimate less than one-fifth stood this test. Of the European individual samples, several showed fine qualities of resistance.

Some of the individual samples of American grown seed showed much better results than one would have expected from observing the effects of the frost on the mixed sample of seed. There was from one-third to one-half a crop in some cases, after the above named spring freezing. Some plants entirely lost the seed leaves and yet continued to grow from the plumule.

The work indicates that the idea of selecting to gain plants of resistant powers against spring frosts is worthy of further effort. The work in the autumn also suffered because of an unfavorable season for the purpose. The growth from the seed in the spring was backward until late, then the seed from all plantings, following a light rain on July 2d and 3d, came along as if of one date of planting; and, again, owing to the cool growing weather of July and of August, all plantings after July 9th failed to mature seed. No reliable or even probably worthy selections were possible under these conditions. Plantings Nos. 2, 3, 4, 5, 6, 7, 8, 9 and 10 all escaped both spring and autumn frosts. Plantings Nos. 11, 12 and 13 received fall frosts, but had been so delayed by the slow growing conditions of July and August that all were finally caught and de-

stroyed by heavy freezing before maturing any seed. Several selections of seed were made from growths in planting No. 1.

In conclusion it may be said that frost destruction of this crop is so great each spring and fall that, slight as were the results of these efforts, it seems that further trials should be made.

Selection of Flax for a Short Season Strain—Plantings were made from numerous different European and American samples upon different dates. These were studied as to their growth period. Fourteen selections of seed were made, eleven of which were from the European samples. It is evident that something can be accomplished along this line. Samples differed in the length of the growth period as much as two weeks. It was observed that American grown samples of flax seed quite uniformly demanded a longer vegetation period than the European samples.

Composting Flax Straw to Destroy Spores of the Flax Wilt Fungus—In October of 1902, small, compact bundles of wilted flax straw, bearing spores of the disease, were placed into a newly made compost heap of barnyard manure. August 29th, one bundle was removed for study. The straw in parts was well rotted, in other parts it appeard as if burned by the composting or had dry rotted. Various culture methods were tried upon this material, but no growth of *Fusarium* was obtained in any case. Further tests will be made at another time. Examinations will also be made into the surrounding manure.

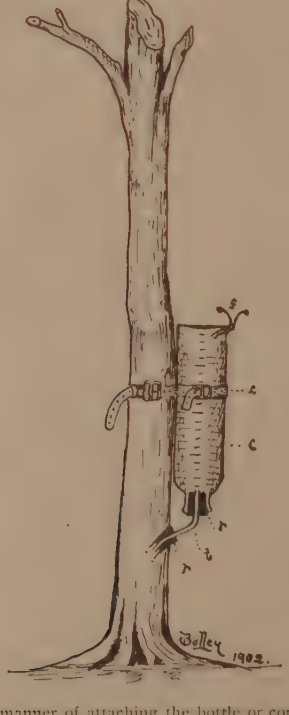
Soil Fungi and Their Relation to Flax Wilt—Numerous pure cultures of fungi have been made from the soil of flax sick areas, from diseased flax seed samples, American and European, and from materials collected by H. L. Bolley in Belgium and Russia. These cultures were used in various infection tests, in the laboratory and in the field. A full report of this work will be given to a later publication in connection with thesis work by Mr. Manns. It is sufficient here to note that all of the work confirms our previous conclusions upon the destructive nature of *Fusarium lini,* and also of an observed undescribed species of *Collelotrichum.*

Tree Feeding and Tree Medication—Everyone has perhaps during his boyhood days met the old farmer who grew the big prize winning squash for the county fair by feeding it sweet milk or perhaps water, which it sucked up through a cut off branch nearest the joint to which the squash was attached. I do not know how many persons have actually ever seen the work of feeding the squash in operation. I never was able to witness the performance, though being curious, as a boy, I often tried to make the squash feed. One also often sees cursory notes in farm papers to the effect that trees will suck up moisture through broken branches which are dipped in a pail of water, etc., but I know of no serious attempts to test the merit in these various claims. My curiosity remains in the matter, and having as early as the summer of 1896 made an attempt at tree feeding and medication which acted in a most finished and

destructive way upon six apple trees, I determined in the spring of 1902 to give the matter a serious test. (See page 61, Thirteenth Annual Report.)

The economic purpose of such a test is evident: (1) Trees take up food matters of a definite type in water solutions; thus, if trees can be directly fed, aside from the natural source, then we can learn *what* to feed, and *how* and *when* to do it. (2) Trees are subject to two sorts of disease, (a) simple physicological derangement due to faulty nutrition, and (b) parasitic (animal and plant); thus, if plants may be directly fed, then we may, perhaps, subject them to such direct or internal feeding as to correct faulty conditions of nutrition, and, perhaps, so medicate the food supply as to relieve or guard the plant against parasitic attacks.

It was found at once, upon a properly conducted trial, that trees will take up water solutions in large quantities, and that the work can be done with ease without injury to the trees.



Cut No. 1. Shows the manner of attaching the bottle or container used in feeding trees; *f*, a small funnel for filling the container; *l*, strap clasping bottle and tree; *c*, the bottle with a scale so arranged as to show the rate of feeding; *r*, rubber corks; *t*, a glass or other tube connecting container to a small auger hole in the body of the tree.

The method of feeding developed is simply to bore a small hole into the body of the tree until the heart wood is reached. This is at once filled with water to exclude air. Then a feeding flask or bottle is attached to the opening as shown in the accompanying cut, by a rubber or other close connection.

The work as conducted during the growing season of 1902 and again in 1903 is too extended for detailed account here. We have yet also much to learn before ready to write. A full report of the work to date is being summarized, and when further points are cleared up we think that we shall have some results which will quite be worth while. Here we can only say that there have been surprises at every stage of the work, and, at least, we are getting some education as to what a tree can do when it once decides to "take to the bottle."

During the season of 1902, eleven trees were under consideration for a period of forty-seven days, and eleven different feeding solutions were used.

In 1903, three of these trees were continued in the same trials for the same period of time as in 1902. Three new trees were placed under test, and three new test substances were used.

The trees used in these experiments were cottonwoods and apple trees.

We have made numerous observations upon the work, some of which are easily explainable, others need further research. The work has given returns beyond our best hopes. It is certain that along this line of work we shall be able to get tangible results looking toward the solution of many physiological problems affecting our present knowledge of plant life. Thus, by this way, persistently pursued, we may yet learn much to influence our theories regarding the ascent of sap in trees, assimilation and translocation of food matters, fruit setting, transpiration, etc.

The following are a few of many observations recorded: (1) Other conditions being equal, a tree seems to feed at about uniform rate day or night. (2) The rate is varied by many circumstances, as for example, (a) atmospheric temperature, (b) atmospheric moisture, (c) water supply in soil, (d) strength of the solution applied, etc. (3) Trees vary in their rate of feeding (a) with regard to kind, and (b) with regard to their natural strength of growth, size, etc. (4) Chemical substances are carried to the most distant parts of the tree in a few hours; thus in ten hours substances could be detected (*microchemically*) in the topmost twigs of cottonwood trees, thirty to forty-five feet high. (5) Diffusion is not rapid radially in cottonwood trees, that is, the movement of the liquid is most rapid and effectually evidenced vertically. (6) The killing effect of strong solutions appears to be in a direct relation to strength. (7) As to direct effect upon a tree, (a) one may kill a tree to its furthermost root, (b) check growth, or (c) accelerate growth by these direct methods of tree feeding. (8) As to the effect upon

parasitic disease the work is yet inconclusive. In the cottonwood we have not been able to prevent the occurrence of the usual annual attack of rust (*Melampsori*). In the test on apple blight (pear blight), they have as yet been too limited to even hope for results. In one trial in the summer of 1896, six trees which were blighting badly were internally treated, five died at once, the sixth completely died on one side to past the center. It has not blighted since, but is a healthy producer of fruit. This may, perhaps, be but a coincidence. In the trial of 1902, the work was undertaken after the blighting had started, and had apparently no effect in preventing the occurrence of blight again in 1903. It is possible that the treatment, in part, may have been responsible for an apparent increased setting of fruit during the season of 1903. (9) Under certain conditions trees may not only fail to feed from the bottle, but may show a back flow into the bottle, even when in full foliage.

This statement is, perhaps, sufficient at the present time. It was intended to withhold a report upon this work for one or more years yet, but, by inadvertance, a friendly observer has lately brought the matter up for discussion before the North Dakota Horticultural Society, and for this reason a preliminary statement, at this time, is thought advisable.

Respectfully submitted,

HENRY L. BOLLEY,

Botanist.

AGRICULTURAL DEPARTMENT.

To Director J. H. Worst:

SIR: In submitting to you the Fourteenth Annual Report of the work of this department, it is necessary for me to recount the changes in the force of experimenters and in the list of teachers in the agricultural division of the College, which has caused a sad reduction in the working efficiency of our force.

The position left open by the resignation of Professor Ten Eyck has recently been filled by the election of Professor J. C. McDowell, and the position left vacant by the resignation of Professor C. J. Zintheo has been filled by the appointment of Mr. Olaf Nordby, a former graduate of this institution. It is also my duty to report to you that the resignation of Mr. H. M. Ash as farm foreman left a vacancy which has been filled by the election of Mr. Nicholas Grest. Mr. L. F. Seneco, who has been employed in the seed breeding and variety testing work as expert help for about eight years, handed me his resignation last July. A number of other changes in the force of expert field men have occurred during the year. Most of the vacancies have been caused by private firms offering our help more than the limited resources at our command would warrant us in paying.

I am aware that the state has never co-operated with the government in the support of the Experiment Station, and I realize that by reason of that fact we are not prepared to compete with similar institutions in other states in securing and retaining the services of expert men, as the substantial advance in income and position which has been tendered these young men bears evidence.

The writer's time has been sadly decimated by the aid which it has been necessary to give these new men by reason of their being unfamiliar in most cases with Experiment Station and College work and from the conditions which prevail in this state being so different from those which have surrounded young men whose experience has been altogether in states further east.

I have found also that men must be allowed to follow their individual plans to a certain extent if they are to be efficient and original investigators, all of which limits the total net results to the Station when changes are frequent.

One of the strongest recommendations which I would urge upon you is the necessity of providing sufficient funds to retain the services of suitably qualified experimenters. I would not recommend the

indiscriminate advancement of them either in salary or recognition, but there seems to be no way of retaining such help except by paying as much for it as other institutions are willing to do.

Many side duties fall upon the members of this department with the development of the institution. Farmers' excursion parties almost completely occupy the time of the entire force during the ten days to two weeks which it requires for them to be shown about the grounds, and for the work of the institution to be explained to them. The department also gives a considerable amount of time to the various agricultural fairs of the state in the way of expert judging, which, although an effective and advisable means of disseminating information, breaks in upon the time of the Station workers and reduces their capacity for experimental results.

The College and school classes have grown so large that they require additional work, owing to the large numbers which must now be accommodated. During the past year it has been necessary in some instances to divide classes and have the teacher do double and in some cases treble duty to accommodate those who applied for agricultural instruction. The ten day stock and grain judging school is a new feature which almost completely occupies the time of three men from this department during the ten days or two weeks, and causes a cessation of experimental work during that period in so far as those who are actually teaching in that school are concerned. The conducting of excursion parties of animal husbandry students to Chicago and St. Paul at another season of the year represents a valuable feature of educational work for our younger farmers, but it also takes time from College work. The grain and stock growers' convention, an occasional farmers' institute and other meetings of a similar nature are additional features of the season's work, which do much toward disseminating the information gathered by the Station workers and are valuable features of the year's results, but they reduce the capacity of the data gathering force of workers.

The Edgeley Sub-Station requires practically all the time of Supt. O. A. Thompson, while the writer finds it necessary to make frequent trips and to spend a considerable portion of his time in planning and directing the important work that is being carried on at that point.

Another feature which requires a considerable expenditure of time on my part is the answering of specific agricultural questions by direct correspondence. The 1,928 typewritten pages in my copy book for the twelve months of 1903 bear mute testimony of the expenditure of a considerable portion of my time for the year. I have spent a large amount of time in an attempt to bring out the merits of macaroni wheat as a market product with apparently good success, although the effort required a great deal of time and a vast amount of energy.

I have called attention to the above items as a means of getting the fact before you that the work required of this department is very different from that which was expected of it ten or even five years ago.

A pressing need of the department is a suitable building for the storage of seeds. The Station and the state is still suffering from the loss which it sustained in the destruction by fire of a number of strains of improved grain in the winter of 1901. There is a strong demand on the part of crop producers in this state for the seed of well bred strains of field crops. The Station has produced stocks of seeds by breeding and selection which have superior merit, and which would effect marked improvement if they could replace the strains which are now in the hands of the people. With our present storage facilities it is impossible to distribute or increase in quantity new seed as rapidly as its improvement by breeding and selection would warrant. For example, two well bred varieties of potatoes have been increased in quantity until the Station could grow enough in a single season to give the potato growers of the state a good start of seed. The Station has no place to store potatoes except in primitive earthen pits in the field, and such an uncertain process of carrying them through the winter makes the distribution of seed impracticable. The demand for improved seed from the Station is unabating, and the reports which I have received from the farmers who have secured good strains of seed from us during the past few years indicate that they are rapidly disseminating them among their neighbors, and that in a short time these strains will replace the old and less valuable kinds which were formerly grown in the state. I have been gratified and really surprised that they have met with such favorable reception and that they have been disseminated so rapidly.

The co-operative aid of the United States Department of Agriculture in the seed breeding work of the Station accounts largely for the ability of the Station to produce good strains more rapidly than we are able to increase them in quantity and distribute them. The department officials with whom I have discussed the matter, and who represent the government's side of the co-operative work, seem disappointed when they find that the seed which their co-operative aid helps to produce cannot be increased and placed in the hands of producers as rapidly as it would be possible to do with good equipment. The United States Department of Agriculture proposes to make a substantial increase in the co-operative aid which it will give to the seed breeding work during the coming year. The faith which this increased aid implies places us under obligation to secure better storage facilities, in order that the state may obtain the fullest advantage which it will be possible to secure from the work.

J. H. SHEPPERD.

PLANT BREEDING.

The work of plant breeding in co-operation with the Bureau of Plant Industry, Department of Agriculture, Washington, D. C., has been carried forward in much the same manner as that which was reported upon a year ago. Something over 50,000 plants were matured in the plant breeding nursery in 1903, which included the following stocks: Wheat, oats, barley, flax, buckwheat, millet, alfalfa, red clover, corn, potatoes, brome grass, slender wheat grass and timothy. The distribution work has also been continued, the Station having sent out thirty-five and three fourths bushels of corn to twenty-eight different growers, sixty-eight bushels of macaroni wheat to eleven growers, and 300 pounds of slender wheat grass to four growers.

The importance of the seed breeding and distribution work has been so regularly presented in my past reports that I will only add herewith the detailed statement of the names of the stocks or strains of plants which we have grown during the past season, and in a brief form the objects sought in each case.

Breeding for high protein content in corn has been continued in co-operation with the Chemical Department of the Station, and while it is not yet carried far enough to be worthy of very great consideration, it is nevertheless an important piece of work, which is being continued, with its accumulating results, as rapidly as passing time and the facilities of the Station will permit.

The checking up of our co-operating grain growers and the personal conferences which Mr. Schollander is able to have with them in the interests of the plant distribution work during the progress of his tour of the state in presenting the subject of seed improvement upon the farmers' institute platform constitutes a valuable adjunct to the plant breeding and seed distribution work. The department is greatly benefitted by the prominence which he gives the work in his addresses to our farmers and in the reports which he is able to secure from them by means of personal visits. It also enables the Station to secure the co-operation of suitable men in carrying on the work of distribution. I find that those who secure grain from the Station distribute it widely by selling to their near and remote neighbors, thus vastly extending the good which is effected by the plant breeding work.

Fife, 18 stocks fixed type	4,500 plants
Blue stem, 36 stocks unfixed type	3,400 plants
Cross breds	2,700 plants
Macaroni	500 plants
Total	11,100 plants

Whorled oats, 6 stocks fixed type	3,100 plants
Side oats, 1 unfixed type	800 plants
Cross breds	100 plants
Total	4,000 plants
Six-rowed barley, 4 stocks fixed type	1,600 plants
Two-rowed barley	900 plants
Total	2,500 plants
Flax bred for seed, 12 stocks	3,000 plants
Flax bred for fibre	1,400 plants
Total	4,400 plants
Buckwheat, light colored seeds	500 plants
Buckwheat, dark colored seeds	900 plants
Buckwheat, red type of seed	100 plants
Total	1,500 plants
Millet for seed, 11 stocks of millet	3,000 plants
Millet for fodder	400 plants
Millet for fodder and seed	200 plants
Total	3,600 plants
Turkestan alfalfa	1,496 plants
Grimm alfalfa	1,394 plants
Red clover	1,462 plants
Total	4,352 plants

Three varieties of potatoes are being selected for high starch content. The results from two years' work are promising.

Ten ears of Minnesota King corn, selected for high protein and ranging in the proportion of proteids from 14 to 15.44 per cent, were grown as a continuation of the trial.

Six ears of Golden Dent corn, ranging in proteids from 12.06 to 14 per cent, were selected and grown in the way described above for the Minnesota King strain.

Twenty-five ears of Golden Dent corn were planted in separate rows, that the earlier, better grain and fodder yielding progeny might be selected and perpetuated.

VARIETIES OF WHEAT.

Forty-eight varieties of wheat were sown on the dates of May 2 and 4, 1903, at the depth of two inches. The fife and blue stem strains were sown at the rate of five pecks per acre, and the macaroni varieties at the rate of six pecks per acre. The larger size of the berries of macaroni wheat makes it necessary for the grain to be sown at a higher rate per acre than the fife and blue stem varieties require. It is scarcely probable that any greater number of seeds are distributed upon an acre of ground in seeding macaroni at the rate of

six pecks per acre than results from seeding fife and blue stem varieties at the rate of five pecks per acre. The varieties of wheat were sown upon one-tenth acre plots with eighteen inch intervening alley ways, upon ground which had produced corn in 1902. The ground was double or cross disced in the spring, and harrowed once with a peg-tooth harrow. The soil was very wet at the time of preparing it for wheat seeding, which interfered with the work to some extent. To secure good and uniform results in seeding the grain, the large corn roots or stubs which came to the surface were thrown aside in front of the drill. For field seeding such a process would not be necessary, but where results are to be compared it is advisable to have the conditions of covering uniform. A double disc Dowagiac drill was used in seeding the varieties of wheat. A shoe drill would doubtless have caused some trouble by dragging the corn stubble and clogging. By the 12th of May the grain was up on all the plots of ground and made a good showing. A week later the color was good, the grain showed a thrifty appearance and was free from weeds. The table furnished herewith gives a full record of the facts obtained in the trial:

TABLE I.—VARIETIES OF WHEAT—CROP OF 1903.

Bulletin No.	Variety	Class	Where From	Days Maturing	Length of Stem—In.	Length of Head—In.	Bearded, Smooth or Velvety	Grade			
								Weight Per Bu.—Pounds	Grade	Yield Per Acre—Bushels	Average Yield—Crop '02-'03
197	Preston	Crossbred	Prof. Wm. Saunders, Ottawa, Can	97	40	3	Bearded	61½	1N	38.8	31.9
250	Sel. Glyndon (818)- Minn. 155	Fife	Minn. Experiment Station	102	38	2¾	Smooth	60½	1N	37.9	31.0
260	Selected Minnesota 293	Fife	Minn. Experiment Station	102	44	3	Smooth	60½	1H	38.2	31.9
261	Experiment Station No. 66	Fife	Jno. A. Davis, Buxton, N. D.	102	44	3	Smooth	60	1N	38.5	30.8
254	Pillsbury	Fife	Northrup, King & Co.	102	44	3	Smooth	59½	1N	37 1	30.9
253	Saskatchewan	Fife	Northrup, King & Co.	102	42	2¾	Smooth	61½	1H	34.4	29.2
258	Selected Minn. No. 288	Fife	Minn. Experiment Station	100	42	3	Smooth	61½	1H	40.8	33.3
257	Selected Minn. No. 285	Fife	Minn. Experiment Station	104	41	3¼	Smooth	61½	1H	41.3	34.4
286	Wilcox	Fife	W. W. Kempton, North Dakota	102	43	3½	Smooth	60½	1N	38.9	30.8
236	Wellman's	Fife	Exp. Farm, Brandon, Man.	102	46	3½	Smooth	60	1H	42.3	32.5
288	North Dakota- crossbred	Fife	North Dakota Exp. Station	102	42	3	Smooth	60¾	1H	41.6	31.6
290	North Dakota--crossbred	Fife	North Dakota Exp. Station	102	42½	3¼	Smooth	61¼	1H	44.4	34 9
295	North Dakota—crossbred	Fife	North Dakota Exp. Station	102	40	2¾	Smooth	61	1H	36.5	29.7
252	Sel. McKendry's--Minn. No. 161	Fife	Minn. Experiment Station	104	42	3	Smooth	61½	1H	44.5	34.2
151	Glyndon No. (711)	Fife	Minn. Experiment Station	101	39	2¾	Smooth	58½	1N	43.4	....
292	Canada	Fife	Geo. Springsted, Crystal, N. D.	101	40	3	Smooth	58½	1N	37.7	....
293	Sel. Rystings—Minn. No. 171	Fife	Minn. Experiment Station	102	42½	3	Smooth	57¼	1N	42.3	....
294	Selected Powers	Fife	North Dakota Exp. Station	101	38	2¾	Smooth	57½	1H	41.5	....
295	Selected Powers	Fife	North Dakota Exp. Station	101	38½	2¾	Smooth	60½	1N	42.1	....
296	Selected Glyndon (811)	Fife	Minn. Experiment Station	104	38½	2¾	Smooth	59	1H	41.5	....
297	Selected Glyndon (753)	Fife	Minn Experiment Station	104	44	2¾	Smooth	58	1N	29.2	....
289	North Dakota—crossbred	Fife	North Dakota Exp. Station	102	43	2¾	Smooth	61	1H	32.5	30.2
298	North Dakota—crossbred	Blue Stem	North Dakota Exp. Station	104	43	3	Velvety	59¾	1N	34.8	....
299	North Dako a—crossbred	Blue Stem	North Dakota Exp. Station	100	41	3	Velvety	61¼	1H	35 8	....
262	Haynes' Pedigree	Blue Stem	L. H. Haynes, Fargo, N. D.	104	42	3	Velvety	60	1N	36.7	30.4
263	Marvel	Blue Stem	John A Salzer Seed Co.	104	43	3¼	Velvety	60	1N	37.7	29.4
264	Haynes' Minn. No. 51	Blue Stem	Minn. Experiment Station	104	45	3	Velvety	60½	1N	39.3	30.2
265	Bolton's Minn. No. 146	Blue Stem	Minn. Experiment Station	104	48	3¼	Velvety	60	1N	43.2	30.3
267	American	Blue Stem	Wm. Rennie, Toronto, Can.	104	48	3	Velvety	60	1N	40.3	29.9
300	North Dakota—crossbred	Blue Stem	North Dakota Exp. Station	104	46	2¾	Velvety	60½	1N	39.1	....
287	Selected Haynes	Blue Stem	North Dakota Exp. Station	104	48	3	Velvety	56½	1N	47.3	35.5

TABLE I.—VARIETIES OF WHEAT—CROP OF 1903—Continued.

Bulletin No.	Variety	Class	Where From	Days Maturing	Length of Stem—In.	Length of Head—In.	Beardless, Smooth or Velvety	Grade			
								Weight Per Bu.—Pounds	Grade	Yield Per Acre—Bushels	Average Yield—Crop '02-'03
301	Davis'	Blue Stem	John A. Davis, Benton, N. D	102	43	3 3/4	Velvety	59 1/4	1N	39.7	....
268	Aronautka	Macaroni	T. N. Olum, Lisbon, N. D	101	45	3 1/2	Sm Bearded	61	No. 1	43.4	36.0
269	Wild Goose	Macaroni	Wm. Rennie, Toronto, Canada	101	44	3 1/2	Sm. Bearded	61 1/2	No. 1	44.0	35.1
270	Berdianska U. S. No. 1586	Macaroni	Russia by U. S Dept. of Agr.	100	40	3	Sm. Bearded	62 1/2	No. 1	40 6	34.6
271	Navowssick U. S. No. 1567	Macaroni	Russia by U. S. Dept. of Agr.	100	41	3	Sm. Bearded	62	No. 2	41.5	31.0
273	Argentine U. S. No. 1740	Macaroni	Marseilles, Fr., by U. S. Dep. Ag.	99	40	3	Sm. Bearded	63	No. 1	44.6	37.0
274	Tagenrog U. S. No. 1570	Macaroni	Tagenrog, Rus., by U. S. Dep. Ag.	100	39	3 1/4	Sm. Bearded	62 3/4	No. 1	46.7	39.2
276	Medeah U. S. No 1371	Macaroni	Algeria, by U. S. Dept. of Agr.	96	42	3 1/4	Sm. Bearded	59 1/2	No. 2	36.6	33.0
277	Yellow Gharnovka U. S. No. 1444	Macaroni	Ambroceivka, Rus., U. S. Dep. Ag.	98	42	3 1/2	Sm. Bearded	62 1/2	No. 1	41.7	37.3
279	Black Don U. S. No. 1446	Macaroni	Ambroceivka, Rus., U. S. Dep. Ag.	98	40	3	Vel. Bearded	62 1/2	No. 1	45 5	39.4
280	Gharnovka U. S. No. 1447	Macaroni	Tagenrog, Rus., by U. S. Dep. Ag.	99	39	3 1/4	Sm. Bearded	62 1/2	No. 1	46.5	38.4
281	Beloturka U. S. No. 1520	Macaroni	Russia by U. S. Dept. of Agr.	100	43	3 1/4	Sm Bearded	59 3/4	No. 1	46.3	38.1
282	Kubanka U. S. No. 1440	Macaroni	Malsk Fer., Rus., U. S. Dep. Ag.	99	43	3	Sm. Bearded	62 3/4	No. 1	44.0	36.3
283	Velvet Don U. S. No. 1445	Macaroni	Ambroceivka, Rus., U. S. Dep. Ag.	99	42	3	Vel. Bearded	63	No. 1	42.6	37.6
302	Nicaragua U. S. No. 4277	Macaroni	U. S. Dept. of Agriculture	100	43	3 1/4	Sm. Bearded	64	No. 1	48.8	....
223	Kubanka U. S. No. 2953	Macaroni	Russia, by U. S. Dept. of Agr.	100	44	3 1/4	Sm. Bearded	62 3/4	No. 1	40.4	....
222	Pererodka U. S. No. 2954	Macaroni	Russia, by U. S. Dept. of Agr.	100	42	3	Sm. Bearded	62	No. 1	47.0	36.3
278	Gharnovka U. S. No. 1443	Macaroni	Ambroceivka, Rus., U. S. Dep. Ag.	100	40	3	Sm. Bearded	63	No. 2	44.5	35.1

In presenting the data in tabular form the varieties have been grouped into classes in accordance with their fife, blue stem and macaroni characteristics. It will be noted that the yields for 1903 were unusually high, although the average for the two seasons of 1902 and 1903 made a good showing. It will also be noted that the macaroni varieties gave better yields than either the fife or blue stem strains as groups. Summarizing the different classes of grain for 1903, and taking the average yield for the six best varieties of macaroni, fife and blue stem, the following tables result:

TABLE II.—VARIETIES OF WHEAT IN EACH CLASS GIVING LARGEST YIELDS IN 1903.

Bulletin No.	Variety	Class	Grade	Weight Per Bu.—Pounds	Yield Per Acre—Bushels
252	Selected McKendry's Minn. No. 181	Fife	1H	61½	44.5
290	North Dakota crossbred	Fife	1H	61¼	44.4
151	Glyndon No. 711	Fife	1N	58½	43.4
293	Selected Rystings Minn. No. 171	Fife	1N	57½	42.3
295	Selected Powers	Fife	1H	60½	42.1
288	North Dakota crossbred	Fife	1H	60¾	41.6
287	Selected Haynes	Blue Stem	1N	56½	47.3
265	Bolton's Minn. No. 146	Blue Stem	1N	60	43.2
267	American	Blue Stem	1N	60	40.3
301	Davis'	Blue Stem	1N	59¼	39.7
264	Haynes' Minn. No. 51	Blue Stem	1N	60½	39.3
300	North Dakota crossbred	Blue Stem	1N	60	39.1
302	Nicaragua	Macaroni	No. 1	64	48.8
222	Pererodka U. S. No. 2951	Macaroni	No. 1	62	47.0
274	Tagenrog U. S. No. 1550	Macaroni	No. 1	62¼	46.7
273	Argentine U. S. No. 1740	Macaroni	No. 1	63	44.6
280	Gharnovka U. S. No. 1447	Macaroni	No. 1	62½	46.5
281	Beloturka U. S. No. 1440	Macaroni	No. 1	59¾	46.3

TABLE III.—COMPARING THE AVERAGE YIELD OF THE SIX BEST VARIETIES OF WHEAT IN EACH CLASS FOR 1903.

Class	Yield Per A.—Bu.	Difference—Bu.
Macaroni	46.65	....
Fife	43.17	3.48
Blue Stem	41.49	5.16
Blue Stem and Fife	42.33	4.32

From the above tables it will be seen that the six best macaroni varieties made an average yield of more than forty-six bushels of wheat per acre, while the six best fife strains produced more than forty-three bushels per acre. The blue stems yielded less than the fife varieties and failed to average as high in grade.

From the above tables it will be noted that the macaroni strains out-yielded the fife and blue stem varieties this year four and one-

third bushels per acre, which is quite in keeping with the results obtained during the previous four seasons of the trial. During the five years from 1899 to 1903 we have noted the yields from the three best varieties of macaroni wheat as compared with the three best fife and blue stem performing strains is four and two-tenths (4.2) bushels per acre, as is shown in Table IV.

TABLE IV.—COMPARING THE AVERAGE YIELD OF THE THREE BEST VARIETIES OF MACARONI WHEAT AGAINST FIFE AND BLUE STEM FOR FIVE YEARS.

Year	Macaroni	Fife & Blue Stem	Difference
1899	34.9	26.6	+8.3
1900	20.5	23.6	−3.1
1901	33.1	28.6	+4.5
1902	32.6	24.9	+7.7
1903	47.5	43.8	+3.7
Average for five years	33.7	29.5	+4.2

The range by years is from three and one-tenth (3.1) bushels less for the macaroni wheat in the season of 1900 to eight and three tenths (8.3) bushels greater yield in the season of 1899. The results presented in this tabular statement constitute a strong indorsement of the yielding capacity of macaroni wheat.

Summarizing the results obtained from the five best yielding varieties of fife, blue stem and macaroni wheat for the seasons of 1902 and 1903, we have the following tabular statement of facts:

TABLE V.—VARIETIES OF WHEAT IN EACH CLASS GIVING THE LARGEST AVERAGE YIELD IN 1902-1903.

Bulletin No.	Variety	Class	Grade		Weight Per Bu.—Pounds		Average Yield Per Acre—Bushels
			1902	1903	1902	1903	
290	North Dakota crossbred	Fife	2N	1H	59¼	61¼	34.9
257	Selected Minn. No. 285	Fife	1N	1H	60½	61½	34.4
252	Selected McKendry's Minn. No. 181	Fife	1N	1H	60¼	61½	34.2
258	Selected Minn. No. 288	Fife	1N	1H	61	61½	33.3
236	Wellman's	Fife	1N	1H	59¾	60	32.5
287	Selected Haynes	Blue Stem	2N	1N	59½	56½	35.5
262	Haynes' Pedigreed	Blue Stem	1N	1N	59¾	60	30 4
265	Bolton's Minn. No. 146	Blue Stem	2N	1N	57¾	60	30.3
264	Haynes' Minn. No. 51	Blue Stem	2N	1N	58½	60½	30.2
267	American	Blue Stem	2N	1N	57	60	29.9
279	Black Don	Macaroni	no gr.	No. 1	63	62½	39.4
274	Tagenrog U. S. No. 1570	Macaroni	No. 2	No. 1	63¾	62¾	39.2
280	Gharnovka U. S. No. 1447	Macaroni	No. 1	No. 1	63½	62¼	38.4
281	Beloturka U. S. No. 1520	Macaroni	No. 1	No. 1	63	59¾	38.1
283	Velvet Don U. S. No. 1445	Macaroni	No. 2	No. 1	64½	63	37.6

The greater the number of years which may be summarized into a record the larger the degree of importance which can be placed upon the evidence. The table has the additional feature of giving the grades which the wheat was awarded.

Summarizing the results for three years for the five best varieties in the three different classes, we have the following tabular statement of the yield and grade, which is in an easy form for reference:

TABLE VI—VARIETIES OF WHEAT IN EACH CLASS GIVING THE LARGEST AVERAGE YIELD FOR THREE YEARS.

Bulletin No.	Variety	Class	Grade			Weight Per Bushel—Pounds			Average Yield Per Acre
			1901	1902	1903	1901	1902	1903	
257	Selected Minn. No. 235	Fife	2N	1N	1H	60	60½	61½	32.2
252	Selected McKendry's Minn. No. 181	Fife	2N	1N	1H	58½	60¼	61½	31.9
258	Selected Minn. No. 238	Fife	2N	1N	1H	58	61	61½	30.2
260	Selected Minn. No. 298	Fife	2N	2N	1H	58½	60	60½	29.8
254	Pilsbury	Fife	3N	1N	1N	58	60½	59½	29.6
267	American	Blue Stem	2N	2N	1N	59	57	60	30.2
265	Bolon's Minn. No. 146	Blue Stem	2N	2N	1N	59	57¾	60	30.1
264	Haynes' Minn. No. 51	Blue Stem	2N	2N	1N	59½	58½	60½	3.0
262	Haynes' Pedigreed	Blue Stem	2N	1N	1N	58	59¼	60	29.6
263	Marvel	Blue Stem	2N	1N	1N	58	58½	60	29.1
280	Gharnovka U. S. No. 1447	Macaroni	No. 2	No. 1	No. 1	61	63½	62¼	36.3
281	Beloturka U. S. No. 1520	Macaroni	No. 2	No. 1	No. 1	62	63	59¾	36.3
274	Tagenrog U. S. No. 1570	Macaroni	No. 3	No. 2	No. 1	58½	63¾	62¾	36.1
268	Arnautka	Macaroni	No. 2	No. 2	No. 1	62	62	61	35.4
277	Yellow Ghamovka U. S. No. 1444	Macaroni	No. 2	No. 2	No. 1	61¾	63	62¼	35.2

It is also interesting to note that a large portion of the better yielding strains are from the North Dakota and Minnesota Experiment Station bred varieties. All of the strains listed as selected or cross bred (with the single exception of Preston, a cross bred strain brought out by Dr. Saunders of the Central Experiment Station of Canada) are from either one or the other of these stations. Those who have followed the successful varieties during the last ten years have seen the names of North Dakota farmers in connection with the variety names of the most successful strains, which means that the Station has either improved the varieties secured from its wheat growing neighbors, or that the Station has not been able to collect or breed seeds which are superior to those that the wheat growers of this state have bred up.

As a means of presenting the data secured, in a comprehensive form, a detailed yearly report is made in the following table, which gives the yields that were obtained from varieties that were grown three or more seasons during the last thirteen years:

TABLE VII.—VARIETIES OF WHEAT, GIVING YIELDS PER ACRE FOR THE YEARS GROWN.

Bulletin No.	Variety	Yield Per Acre—Bushels												Av. Yield Per Acre
		1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	
66	Power's Fife	21.33	15.10	12.67	41.25	19.65	10.67	34.66	21.69	18.83	*(261) 26.99	(261) 23.10	(261) 38.52	23.96
23	Red Fife	14.33	12.00	11.07	48.00	25.60	8.67	32.00	25.01	26.39	26.15	22.80	.....	22.91
50	Wellman's Fife	23.00	12.20	.....	42.00	.....	11.67	34.33	24.32	27.97	27.93	21.30	*(236) 42.31	26.70
120	Glyndon (774) Fife	17.33	12.60	11.07	48.33	20.67	8.33	32.96	23.23	.....	.....	.....	.....	21.81
146	Bolton's Blue Stem	.....	17.80	12.27	42.00	.....	10.00	26.43	26.55	25.62	*(265) 29.67	(265) 17.50	(263) 43.20	26.10
148	C. & C. Land Co.'s Fife	.....	.....	11.20	42.00	.....	11.83	26.19	23.42	.....	.....	.....	.....	24.97
151	Glyndon (711) Fife	.....	.....	.....	.....	.....	8.50	35.60	24.78	27.50	.....	24.00	43.36	26.96
197	Preston Crossbred	.....	.....	.....	.....	.....	11.83	37.88	27.62	10.37	24.89	25.00	38.76	25.15
215	Rystings' Fife, Minn. No. 171	.....	.....	.....	.....	.....	.....	38.12	26.63	20.02	.....	†(293) 27.10	(293) 42.34	30.34
216	Selected McKendry's Fife, Minn. No. 181	.....	.....	.....	.....	.....	.....	35.45	24.56	21.72	**252 27.15	(252) 24.00	(250) 44.19	29.56
212	Glyndon (811), Minn. No. 163	.....	.....	.....	.....	.....	.....	37.23	25.86	22.95	.....	.....	.....	28.68
210	Select Glyndon (818), Minn. No. 155	.....	.....	.....	.....	.....	.....	.....	23.63	20.76	**250 25.30	(250) 24.10	(250) 37.86	26.33
253	Saskatchewan Fife	.....	.....	.....	.....	.....	.....	.....	.....	.....	27.18	24.10	34.38	28.55
257	Selected Minn. No. 285	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.93	25.30	41.34	32.19
258	Selected Minn. No. 288	.....	.....	.....	.....	.....	.....	.....	.....	.....	24.93	25.80	40.78	30.50
262	Haynes' Pedigreed Blue Stem	.....	.....	.....	.....	.....	.....	.....	.....	.....	28.13	21.20	36.74	28.69
263	Marvel	.....	.....	.....	.....	.....	.....	.....	.....	.....	28.37	24.10	37.77	30.06
264	Haynes' Minn. No. 51	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.67	24.20	39.32	30.06
267	American Blue Stem	.....	.....	.....	.....	.....	.....	.....	.....	.....	30.47	18.10	40.29	29.62
268	Aronautka (Macaroni)	.....	.....	.....	.....	.....	.....	.....	.....	20.58	34.61	28.70	43.44	31.68
222	Pererodka (Macaroni)	.....	.....	.....	.....	.....	.....	.....	34.87	17.13	31.68	25.70	45.00	31.88
274	Tagenrog (Macaroni)	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.75	31.70	46.75	36.07
223	Kubanka (Macaroni)	.....	.....	.....	.....	.....	.....	.....	30.05	.....	*(283) 32.46	(283) 28.70	(283) 44.01	35.06
280	Gharnovka (Macaroni)	.....	.....	.....	.....	.....	.....	.....	.....	.....	32.40	30.30	46.51	36.40
283	Velvet Don (Macaroni)	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.62	32.50	42.63	34.92
281	Beloturka Macaroni)	.....	.....	.....	.....	.....	.....	.....	.....	.....	32.61	29.80	46.35	36.29

* Original seed from this station.
** Seed renewed from other stations.
† Selected seed from original bulletin numbers.
The small figures enclosed in parentheses are the bulletin numbers now published under.

It will be noticed that record numbers have been changed in some instances. This was necessary because the strains have been somewhat changed. Some of them have taken a vacation at the Minnesota Station for a season or more, and others have been changed by breeding and selection, into forms different enough to be worthy of separate consideration. The missing years are usually the result of some mishap in the field or elsewhere.

The destruction of the College barn in 1901 caused the entire loss of some of the better strains of grain which were in the possession of the Station at that time, and resulted in our collecting them by securing seed from other Stations to whom seed had been given at previous dates. The vast amount of data and of work and the expenditure of funds which is represented by this extensive trial have as their chief object the selection and positive identification of the better strains of grain which the Station is making and placing in the hands of North Dakota grain growers.

A FERTILIZER TRIAL WITH WHEAT.

During the season of 1903 the first comprehensive trial with different fertilizers for grain was begun at this Station. The land selected for the trial had produced a great number of crops of wheat and was what would be called old land. It had been sown to barley the previous season and produced a crop of flax in 1901. Prior to that time the land had been in timothy for a few years. The land had never been enriched by the application of stable manure, and in consequence represented fairly well the older fields of North Dakota which had been cropped constantly to small grain. Different kinds of fertilizers were applied to six plots of ground, and these plots were compared with a seventh which received no fertilizer. The grade, weight per bushel and the percentage of lodged grain were recorded in addition to the yield per acre. The data is presented in a rather comprehensive way in the following tabular statment:

TABLE VIII.—FERTILIZER EXPERIMENTS WITH WHEAT CROP OF 1903.

Plot No.	Name of Fertilizer	Grade	Weight Per Bu.—Lbs.	Yield Per A.—Bushels	Per Cent Lodged
1	Acidulated Bone	1N	59¾	30.4	10
2	Amour's Grain Grower	1N	59½	33.2	5
3	Ammoniated Bone and Potash	1N	60¼	32.2	20
4	All Soluble	1N	60	31.9	3
5	Nitrate of soda	1N	59½	33.0	10
6	Rotted manure	2N	60	29.5	10
7	No fertilizer	1N	60	25.7	3

From the above table it will be seen that the yield from the plot of grain which received no fertilizer whatever was seven and one-

half bushels less than was secured from the fertilizer, Amour's Grain Grower, which gave the heaviest yield per acre. It will also be noted that the plot which was treated with well rotted stable manure, at the rate of ten loads per acre, ranked below those which had been treated with 200 pounds of commercial fertilizer per acre. An interesting fact may be noted in the column which gives the percentage of lodged grain. An inspection of the table will show that the plot receiving no fertilizer was lodged the least and the one with the highest yield was second, while one-fifth of the grain on the Ammoniated Bone and Potash plot was lodged. The indication from that portion of the trial is that grain growers should be on their guard for fear that a heavy application of fertilizer would bring about a severe loss by causing an undue amount of the grain to lodge.

VARIETIES OF WINTER WHEAT.

A few of the seasons prior to that of 1903 gave encouraging results from trials in growing winter wheat on the Station grounds. The plan of the experiment was to allow the winter to destroy all that it would, thus leaving only hardy and vigorous plants with which to continue the trial. Three varieties of winter wheat were used in the trial, one of which sprang from the surviving plants produced annually since 1900, while the others were descended from grain which was first grown upon the Station trial grounds in 1901. The trial was made on a piece of ground which was divided into strips or plots extending from a shelter belt of trees out upon the open field. The wheat plants killed out completely during the winter of 1902-1903 except near the shelter belt, where they were covered with snow. In the sheltered place near the belt of trees mentioned above the stand of grain was very good and produced a heavy yielding patch of wheat, but the exposed portion proved disappointing by failing to have a single plant survive. The grain produced was of good quality, showing a plump and bright berry. The trials thus far carried on by the Station with winter wheat have given results which indicate that it is impractical for North Dakota producers to attempt to grow it.

VARIETIES OF WINTER RYE.

Small plots of winter rye were sown on September 23, 1903, in order that a study might be made of the climatic effect which this northern latitude would have upon the crop, as well as to determine the success of winter rye as a crop for this state.

The land used for the trial was timothy sod which had been broken in May, 1901, and a little later in the season of that year a number of varieties of grasses were seeded upon it and failed to make a stand. They were plowed up on July 9th to a depth of five inches, after which the ground was harrowed several times at various intervals

before the date of seeding the grain, when it was harrowed twice with a peg-tooth drag. The land was in good condition when the grain was seeded, and the crop sprang up quickly and made a good stand by the 9th of September. On April 13th, the following spring, the winter rye was making a good showing. The following table gives the results of the trial in detail:

Bulletin No.	Variety	Date Sown	Date Harvested	Length of Straw In.	Length of Heads In.	Yield Per Acre Bu.
953	Giant	Sept. 3	July 14	46	4½	8.12
959	Home grown	Sept. 3	July 7	49	3¾	33.13
964	N. K. & Co	Sept. 3	July 7	50	4	25.70
1134	N. K. & Co., best	Sept. 3	July 7	51	3½	33.02

The variety numbered 959 was a sample which sprung up in a piece of winter wheat in 1902. There was only a small intermixture of the rye, but as it withstood the winter well while the winter wheat which surrounded it was destroyed, the seed of it was saved with the hope that a hardy strain might be developed.

Sample 964 was purchased from Northrup, King & Co., seedmen, in the fall of 1901, and the first crop was harvested the following summer. The variety 1134, which was produced from seed purchaser from Northrup, King & Co. just before the date of seeding, was what they called their best strain of fall rye. The strain of seed listed 953 was secured from an Ontario seed firm in 1901 and was sown on the trial grounds at the Station in the fall of 1901. It will be seen that the Ontario sample made a very poor yield and has little value for this district of country. The home grown sample which came from the fall wheat intermixture and the one recently secured from Northrup, King & Co. gave reasonably good results. It will be noted also that their dates of harvesting are early enough to permit of their being placed in the shock before other kinds of small grain will require the attention of the grower.

VARIETIES OF OATS.

Twenty-nine strains of oats were planted in the variety trial for 1903. A few of them were recent importations by the United States Department of Agriculture, a number have been secured from the seed firms of the country, while a few are new strains which have been bred up by the North Dakota and Minnesota Experiment Stations. The object of the trial with oats has been to produce varieties of greater value than the strains that are now in the hands of North Dakota oat growers. The misfortune of losing the Station stock

of seed of a few good strains in 1901, when the College barn and seed house was destroyed by fire, has kept the institution from offering superior kinds of oats at earlier dates.

The object of the variety trial is largely to determine which of the varieties improved by breeding and selection in the plant nursery will prove superior when produced upon a field scale. The Station takes pains to collect the seed of varieties which the seedmen and plant breeders of other Stations report as promising for the conditions which prevail in this state.

Three very early oats have been secured, one of which has given excellent yields during the past few years. It was unfortunate during the season of 1903, however, in having its grain forming period fall during the time when a drouth was prevalent in this section of the state.

TABLE IX.—VARIETIES

Bulletin No.	Variety	Where From	Days Maturing	Length of Straw—Inches	Form of Head
110	U. S. No. 5168	U. S. Dept. of Agriculture	79	29	Whorled
84	Sixty Day U. S. No. 5938	Russia by U. S. Dept. of Agricul.	80	28	Whorled
121	English	Wm. Lanxon, Forman, N. D.	84	28½	Whorled
111	Czar of Russia	H. Hammond, Fifield, Mich.	92	36	Whorled
112	North Finland U. S. No. 5139.	Koivikko, Fin., by U. S. Dpt. of A.	92	34½	Whorled
103	Ligowa	Wm. Rennie, Toronto, Can.	92	32	Whorled
104	New Zealand	Wm. Rennie, Toronto, Can.	92	30	Side.
120	Swedish Select U. S. No. 9422	Russia by U. S. Dept. of Agri.	92	34	Whorled
87	Big Four	J. A. Salzer Seed Co.	92	35	Whorled
89	Bow of Promise	J. A. Salzer Seed Co.	92	33	Whorled
46	Selected Black Beauty	North Dakota Exp. Station	92	32	Whorled
119	Twentieth Century	Salzer Seed Co.	92	32	Whorled
48	Zhelarmii U. S. No. 2963	Russia by U. S. Dept. of Agri.	92	36	Whorled
118	Scottish Chief	L. L. May & Co.	92	32	Whorled
100	Siberian White	Wm. Rennie, Toronto, Can.	93	36	Whorled
2	Archangel	College Farm	93	38	Whorled
42	U. S. No. 3	Russia by U. S. Dept. of Agri.	93	35	Whorled
50	Tobolsk U. S. No. 2800	Russia by U. S. Dept. of Agri.	93	38½	Whorled
98	Minn. No. 202	Minnesota Experiment Station	94	34	Whorled
102	Abundance	Wm. Rennie, Toronto, Can.	94	35	Whorled
105	New Danish White	Wm. Rennie, Toronto, Can.	94	32	Whorled
115	White Waverly	Wm. Rennie, Toronto, Can.	94	36	Whorled
116	Golden Cluster	L. L. May & Co.	94	30	Whorled
93	Lincoln	O. H. Will & Co., Bismarck, N. D.	94	36	Whorled
94	Early Gothland Minn. No. 26.	Minnesota Experiment Station	95	35½	Whorled
39	White Russian	Minnesota Experiment Station	99	36	Side.
54	Selected Tartarian	North Dakota Exp. Station	99	36	Side.
122	Selected Great Northern	J. A. Salzer Seed Co.	99	33	Side.
64	Negro Wonder	Farmer's Seed Co.	102	38	Whorled

OF OATS—CROP OF 1903.

Length of Heads—Inches	Lodged—Per Cent	Rust—Per Cent	Color of Berry	Size of Berry	Shape of Berry	Weight Per Bu.—Pounds	Yield Per Acre—Bushels	Average Yield for 1902-1903
5½	0	0	Yellow	Small	Slender	35	50.7	....
5	0	0	Yellow	Small	Slender	34¾	*42.0	57.1
5½	0	0	White	Small	Short plump	39½	41.6	....
6½	0	15	White	Medium large	Short plump	37½	66.1	50.3
7	0	8	Black	Medium	Slender	32¾	51.8	34.6
6	0	20	White	Large	Short plump	39¾	61.6	50.1
6½	0	8	White	Medium large	Medium long	38½	66.3	57.8
5½	0	20	White	Large	Short plump	40	68.2	....
7½	0	20	White	Large	Medium long	40	70.5	56.1
6½	0	15	Light yellow	Medium large	Medium long	35¾	63.4	50.0
6½	0	20	Black	Small	Slender	36¾	68 5	56.4
6	0	15	White	Medium large	Plump	40	53.9	50.8
8	0	15	White	Medium large	Medium long plump	39¾	61.7	48.9
6	0	15	White	Large	Medium long plump	38½	61.6	51.2
7½	0	25	White	Medium large	Long	37½	69.1	58.1
8½	0	20	White	Medium	Short plump	37½	66.9	50.5
7½	0	10	White	Medium	Short plump	39½	59.5	50.6
7	0	15	White	Medium	Short plump	39½	69.9	53.4
7½	0	10	Light yellow	Medium	Medium long	38½	57.4	49.8
7	0	25	White	Medium large	Long plump	36	71.2	59.3
6	0	20	White	Medium	Short plump	37¾	62.0	....
7	0	25	White	Large	Long plump	37½	73.8	58.1
6	0	20	Yellow	Large	Long plump	35¾	61.0	49.9
7	0	10	White	Medium large	Medium long	36½	66.1	50.0
7½	0	20	White	Medium	Medium long	36½	56.5	46.4
8½	0	2	White	Large	Medium long	39¾	74.9	65.3
8	0	2	White	Medium	Medium long	39	77.3	70.6
8	0	5	White	Medium large	Medium long	39	69.6	....
9	0	20	Black	Large	Medium long	35¼	58.6	39.2

* Shelled out badly by sparrows.

The oat varieties were planted upon the wheat ground of 1902 that had been fall plowed and handled so that it was in good condition for a crop. The land had produced a crop of corn in 1901, the effect of which was probably still present to a considerable extent. The ground was harrowed twice, or cross harrowed, on April 22d and 23d, and the grain was sown on the dates of May 4th and 5th. The seed of the oats was treated for smut by the formaldehyde treatment before it was put into the trial. The grain came up promptly, and with the exception of an early strain, which suffered severely from a dry spell of weather during the latter part of June, it did very well, as will be seen by the accompanying table. The grain was threshed on the first day of September, 1903.

The following table gives the fourteen highest yielding varieties grown in the trial for 1903:

TABLE X.—VARIETIES OF OATS GIVING LARGEST YIELD IN 1903.

Bulletin No.	Variety	Days Maturing	Weight Per Bu.—Lbs.	Yield Per A.—Bushels
111	Czar of Russia	92	37½	66.1
104	New Zealand	92	38¼	66.3
120	Swedish Select U. S. No. 9122	93	40	68.2
46	Selected Black Beauty	93	36¼	68.5
87	Big Four	92	40	70.5
2	Archangel	93	37½	66.9
100	Siberian White	93	37½	69.1
50	Tobolsk U. S. No. 2800	93	39½	69.9
102	Abundance	94	36	71.3
115	White Waverly	94	37¾	73.8
93	Lincoln	94	36½	66.1
89	White Russian	99	39¾	74.9
54	Selected Tartarian	99	39	77.3
122	Selected Great Northern	99	39	69.6

The table indicates that there was a decided advantage secured by having a later ripening and filling period during the past season.

Another tabular statement of results is presented herewith which gives the highest average yields for the seasons of 1902-1903, from which it will be seen that a different list of varieties has taken an advanced place, and that the honors are divided somewhat between the early and late strains.

TABLE XI.—VARIETIES OF OATS GIVING LARGEST AVERAGE YIELD FOR 1902-1903.

Bulletin No.	Variety	Average Days Maturing	Av. Weight Per Bu.—Pounds	Av. Yield Per Acre—Bushels
84	Sixty Day U. S. No. 5928	77	34.4	57.1
46	Selected Black Beauty	87	32.0	56.4
87	Big Four	88	32.4	56.1
100	Siberian White	89	34.1	58.1
102	Abundance	90	29.6	59.3
115	White Waverly	90	30.9	58.1
104	New Zealand	94	35.8	57.7
39	White Russian	97	36.4	65.3
54	Selected Tartarian	97	36.1	70.6

It may be noted, however, by consulting both of the tabular reports, that No. 54, which came from the Station plant breeding nursery, gave the highest average yield for both seasons, and that it was the highest yielding strain in the season of 1903. It is a very promising variety, and will be distributed by sale as soon as the quantity in stock can be increased sufficiently to permit the following out of that plan.

The following table summarizes the entire results of the trial made by the Station with the varieties of oats during the twelve years, and forms an interesting study for those who wish to follow it.

TABLE XII.—VARIETIES OF OATS, GIVING YIELDS FOR THE NUMBER OF YEARS GROWN.

Bulletin No.	Variety	Yield Per Acre—Bushels											Av. Yield—Bu.
		1892	1893	1894	1895	1897	1898	1899	1900	1901	1902	1903	
2	Archangel	68.00	33.10	54.50	38.00	64.10	70.82	69.12	23.88	*(108) 42.51	34.10	66.90	51.37
26	Tartarian	.....	31.20	62.25	53.33	54.10	74.87	64.96	34.85	*(83) 43.91	**(54) 63.90	**(54) 77.27	56 06
19	Black Beauty	.....	27.20	66.75	50.67	45.30	65.47	73.89	**(46) 15.37	* 37.21	**(46) 44.30	**(46) 68.50	49.47
12	Race Horse	.....	40.40	62.75	41.50	47.50	74.87	64.96	33.55	*(81) 43.25	*(81) 49.30	.....	50.87
29	Giant Yellow	.....	11.50	30 00	50.33	41.90	74.44	61.32	.....	.....	.....	.....	44.92
39	White Russian	.....	.....	59.75	38.75	37.20	70.38	65.87	38.59	.....	55.80	74.90	55.15
40	Lincoln	.....	.....	52.50	40.00	53.50	68.86	67.91	26 78	***(93) 57.48	***(93) 33.90	***(93) 66.10	51.87
35	American White Banner	.....	.....	54.00	47.33	58.50	72.41	74.27	25.92	*(82) 55.18	*(82) 33.50	.....	52.64
37	Great Northern	.....	.....	58.50	42.00	47.50	75.81	69.27	**(53) 24.63	***(88) 56.02	***(88) 38.05	.....	51.47
36	Early Gotham	.....	.....	59.38	31 33	47.00	75.08	73.13	.....	.....	.....	.....	57.18
38	North Star	.....	.....	32.50	45.00	48.50	70 38	77.67	.....	.....	.....	.....	54.81
41	Lee	.....	.....	.....	.....	34.60	52.66	57 70	34.56	.....	.....	.....	44.38
42	U. S. No. 3	.....	.....	.....	.....	.....	71.47	72.00	25.56	.....	41.80	59.50	54.07
45	Silver Mine	.....	.....	.....	.....	.....	.....	81.08	23.23	***(85) 60.93	***(85) 39.20	***(85) 72.99	55.49
48	Zhelarmii	.....	.....	.....	.....	.....	.....	79 89	21.99	.....	36.20	61.70	49.95
50	Tobolsk	.....	.....	.....	.....	.....	.....	70.64	21.88	.....	36.90	69.90	49.83
51	Swedish Select	.....	.....	.....	.....	.....	.....	75.40	23.04	.....	30.80	68.22	49.37
84	Sixty Day	.....	.....	.....	.....	.....	.....	.....	.....	50.44	72.20	**** 41.96	54.87
98	Minn. No. 202	.....	.....	.....	.....	.....	.....	.....	.....	67.10	48.20	57.37	57.56
87	Big Four	.....	.....	.....	.....	.....	.....	.....	.....	58.80	41 60	70.50	56.97
100	Siberian White	.....	.....	.....	.....	.....	.....	.....	.....	60.50	47 00	69.12	58.87
102	Abundance	.....	.....	.....	.....	.....	.....	.....	.....	58.95	47.50	71.24	59.23
103	Ligowa	.....	.....	.....	.....	.....	.....	.....	.....	58.36	38.60	61.58	52.85

* Seed from Missouri but original seed from this station.
** Seeds are selections from original seed.
*** From seed firms in 1901.
The figures in parentheses are the bulletin numbers as they are published.
**** Partially destroyed by birds.

The selection of a variety of oats which will resist the attack of rust is one of the more important features of oat breeding in the plant nursery.

The record numbers of some of the varieties of oats listed in the above tables have been changed in a way which was described for the wheat varieties listed in Table VI.

VARIETIES OF BARLEY.

Eighteen varieties of barley were sown in the trial for 1903. The seed was treated with formaldehyde in the ordinary way and the ground was prepared in the manner already described for the oat variety land. The varieties of barley were planted on May 5th and 6th at a depth of two inches. The soil was in good condition, and on May 16th the barley was up and making a nice showing.

TABLE XIII.—VARIETIES OF BARLEY—CROP OF 1903.

Bulletin No.	Variety	Where From	Days Maturing	Length of Straw—In.	Length of Head—In.	No. Rows Per Head	Length of Beard—In.	Lodged—Per Cent	Grain				Average Yield for 1902-1903
									Size of Berry	Color of Berry	Weight Per Bu.—Pounds	Yield Per Acre—Bushels	
58	Seneco's Purple	L. F. Seneco, Fargo, N. D.	76	28	1¾	6	4½	0	Large.	Bluish..	58½	36.6	....
51	Minnesota No. 100	Minnesota Experiment Station	77	34	2¼	6	4	2	Medium	Lt. Yel.	50⅛	40.7	50.1
56	Common Six-rowed	E. G. Schollander, Montpelier, N.D.	78	35	2¾	6	5	0	Medium	Lt. Yel.	49⅓	40.3	49.0
45	Great Beardless	John A. Salzer Seed Co	74	40	2¼	6	..	0	Small ..	Lt Yel.	43	34.9	42.1
21	McEwan's Hulless	Park River, N. D.	79	27	3¼	2	6	75	Large...	Amber.	57½	35 5	41.8
49	Barnard's Minn. No. 28	Minnesota Experiment Station	79	34	1¾	6	5	0	Medium	Lt. Yel.	50	38.1	47 2
55	Manscheuri	Wm. Rennie, Toronto, Canada	79	36½	2¼	6	4½	0	Medium	Lt. Yel.	48	39.4	47.6
22	Russian U. S. No. 5	U. S. Dept. of Agriculture	79	35	2⅜	6	5	0	Medium	Lt. Yel.	47¾	39.1	....
44	Silver King	John A. Salzer Seed Co	80	34	2½	6	6	0	Medium	Lt. Yel.	48½	40.7	48.0
47	Mansury's Minn. No. 6	Minnesota Experiment Station	80	36	2	6	5	0	Medium	Lt. Yel.	48	44.5	49.9
48	Minnesota No. 32	Minnesota Experiment Station	80	36	2¾	6	4½	0	Medium	Lt Yel.	48½	40.4	47.1
50	Minnesota No. 87	Minnesota Experiment Station	80	34½	2	6	4	0	Medium	Lt. Yel.	48	36.8	45.8
52	Minnesota No. 105	Minnesota Experiment Station	80	35	2¼	6	4	0	Medium	Lt. Yel.	48¼	39.2	45.8
25	Mansury's Minn. No. 6	Minnesota Experiment Station	80	36	2¼	6	5	0	Medium	Lt. Yel.	47¼	37.1	46.8
7	Two-rowed Mausury	N. B. A G. Co	82	34	2¾	2	6	0	Med. l'ge	Lt. Yel.	47	33.0	45.1
43	Moravian U. S. No. 5793	Hungary by U. S. Dept. of Agri	82	31	2¾	2	6	10	Medium	Lt. Yel.	51	40.2	44.6
19	Success	Minnesota Experiment Station	91	25	3	2	5½	3	Large...	Lt. Yel.	51½	45.3	45.9
53	Highland Chief	Northrop, King & Co	91	27	3	2	5	2	Large...	Lt. Yel.	50¾	42.7	43.9

The varieties of barley were sown upon ground which was used for a trial of thick and thin planted corn during the season of 1902. The barley was more or less irregular in growth as measured by the height and thriftiness in different portions of the plots, being short in straw and head on the thick planted corn ground of 1902, and of good height and bearing good heads where the ground grew corn in rows the previous year. Wild rose bushes were thick on the strips which had grown sowed corn, while the adjoining pieces which had produced corn in rows and had been cultivated the previous season were almost free from that weed pest. The barley varieties showed very noticeable indications of suffering from dry weather the latter part of June. The harvesting of varieties of barley was begun on July 21st, and all of the kinds were threshed on September 11, 1903.

As a matter of summarizing the results for easy reference, the eight best yielding sorts are grouped together in the following table:

TABLE XIV.—VARIETIES OF BARLEY GIVING LARGEST YIELD IN 1903.

Bulletin No.	Variety	Days Maturing	Weight Per Bu.—Pounds	Yield Per Acre—Bushels
51	Minnesota No. 100	77	50½	40.7
56	Common Six-rowed	78	49½	40.3
44	Silver King	80	48½	40.7
47	Mansury Minnesota No. 6	80	48	44.5
48	Minnesota No. 32	80	48½	40.9
43	Moravian U. S. No. 5793	82	51	40.6
19	Success	91	51½	45.3
53	Highland Chief	91	50¾	42.7

For the sake of more extended data, a comparison of the eight highest yielding strains for the seasons of 1902-1903 are given in the following compiled form:

TABLE XV.—VARIETIES OF BARLEY GIVING LARGEST AVERAGE YIELD FOR 1902-1903.

Bulletin No.	Variety	Average Days Maturing	Av. Weight Per Bu.—Pounds	Av. Yield Per A.—Bushels
51	Minnesota No. 100	74½	50.3	50.1
56	Common Six-rowed	75½	47.5	49.0
49	Barnard's Minnesota No. 28	75½	49.3	47.2
55	Manscheuri	76	47.8	47.6
44	Silver King	77	48.3	48.0
47	Mansury's Minnesota No. 6	77	48.0	49.9
48	Minnesota No. 32	77	48.3	47.1
25	Mansury's Minnesota No. 6	77½	48.0	46.8

The strains of barley of the North Dakota Experiment Station breeding were not increased to sufficient quantity for a trial in the variety comparison during the past season. It is interesting to note, however, that the strains of Minnesota Station breeding take a prominent place in the list of best yielding strains as measured by the average yield for the two seasons of 1902-1903. It is also interesting to note that the Manscheuri strain which the Wisconsin Station disseminated several years ago still holds a prominent place among the heavier yielding varieties.

VARIETIES OF EMMER OR SPELT.

A trial with two varieties of emmer or spelt was made in 1903, the results from which are given in the following tabular form:

No.	Variety	Days Maturing	Weight Per Bu.—Lbs.	Yield Per A.—Bu.
2	North Dakota	95	38	*54.44
5	U. S. Dept. Agriculture	95	40	52.01

*Forty pounds per bushel.

The trial resulted in much the same comparative yield as was secured heretofore in similar experiments, the sample given the name of North Dakota showing a greater yield than the one supplied to the Station by the United States Department of Agriculture.

The following summarized statement of the yield of emmer or spelt for the seasons of 1902-1903 shows nearly the same proportionate difference in yields:

No.	Variety	Days Maturing	Weight Per Bu. —Lbs.	Yield Per A. —Bu.
2	North Dakota	94.5	37.5	53.77
5	U. S. Dept. Agriculture	95.5	37	50.91

The result of the trial seems to indicate that the effect of the environment of North Dakota has been to stimulate the yield from seed which has been grown under North Dakota conditions. It is interesting to note that in all such trials the questions of whether the result attributed to environment is an effect produced upon the plant as it grows, or whether it is a selective influence on the part of the climate which throws out the weaker and poorer plants and causes a variety to become a hardier and better yielding strain on that account.

Emmer or spelt is usually compared with barley and oats as an economic grain producer on North Dakota farms. The following table giving the results of six seasons' trial with emmer or spelt, barley, oats and wheat show how they compare in the pounds of grain which they produce per acre on the trial grounds at Fargo:

SHOWING COMPARATIVE YIELDS OF EMMER, BARLEY, OATS AND WHEAT FOR SIX SEASONS.

Kinds of Grain	1898 Lbs.	1899 Lbs.	1900 Lbs.	1901 Lbs	1902 Lbs.	1903 Lbs.	Av. Lbs.
Emmer	2,338	2,291	980	2,518	2,469	2,101	2,116
Barley	2,326	2,360	844	1,946	2,780	2,079	2.056
Oats	2,400	2,436	1,058	1,933	1,988	2,378	2,032
Wheat	2,212	1,552	1,379	1,719	1,590	2,694	1,861
Macaroni wheat	.....	1,948	1,167	1,997	1,943	2,833	1.978

From the above statement it will be seen that emmer or spelt is the stronger yielding crop on the average, although barley is a close competitor and during several seasons proved superior by giving greater yields. The results for the year 1900 indicate that occasionally the yield may be small on account of peculiar seasons. The trials at the Edgeley Sub-Station and the results reported by farmers from different districts outside of the Red River valley indicate that emmer or spelt is much more of a drouth resisting plant than barley and will prove much safer as a feed producing grain in the drier sections of the state. In the Annual Report bearing the date of February 1, 1902, the results of an analysis of emmer or spelt are given together with other trials showing the composition,

proportion of husk to kernel and other points in which it resembles or differs from oats or barley. Subsequent feeding trials made by this Station, and the experience of practical feeders, both indicate that the earlier statement concerning its feeding value was conservative rather than extravagant.

VARIETIES OF FLAX.

Nine varieties of flax were planted as a variety trial in 1903. They were sown at the uniform rate of two pecks per acre at a depth of one and one-half inches, which placed the seed about at the surface of the moist earth. With the exception of No. 16 they were all treated for the wilt disease by the formaldehyde treatment. Four other samples were sown, but as the quantity of seed was so limited as to make it necessary to put them in a small plot, the yields are incomparable with those of the uniform one-tenth acre plots. They were all seeded on the 14th of May, 1903, in uniform plots of ground lying side by side, with eighteen-inch alleyways between the varieties. The seed started growth promptly, as is shown by the fact that our records state that all of the varieties were up and making a good showing on June 22d.

TABLE XVI.—VARIETIES OF FLAX—CROP OF 1903.

Bulletin No.	Variety	Class	Where From	Date Sown	Seed Sown Per Acre—Pecks	Days Maturing	Length of Straw—Inches	Weight per Bushel—Pounds	Yield per Acre—Bushels	Average Yield for 1902-1903
7	Russian	Seed	John A. Salzer Seed Co.	May 14	2	92	19½	54½	16.1	20.9
9	Selected Russian	Seed	Selected No. 7 N. D. Exp. Station	May 14	2	92	20	54½	16.4	20.3
10	Selected Russian	Seed	Selected No. 7 N. D. Exp. Station	May 14	2	92	20	54¾	16.2	21.1
11	Argentine	Seed	C. Hendrickson, Grafton, N. D.	May 14	2	103	18	52½	15.9	19.2
12	Siberian	Seed	C. Hendrickson, Grafton, N. D.	May 14	2	105	23¾	50½	13.0	13.8
13	U. S. No. 8524	Seed	U. S. Dept. of Agriculture	May 14	2	101	23½	50¾	11.7	11.8
14	Common	Seed	Western N. Dak. Magill & Co.	May 14	2	101	19	52¼	21.4	23.4
15	Selected Riga	Fiber	Selected No. 5 N. D. Exp. Station	May 14	2	103	25	50¾	8.6	11.0
16	Selected Common	Seed	North Dakota Exp. Station	May 14	2	93	18¼	53¾	17.5	....

The Argentine sample again showed a tendency to produce large, strong blossoms of flax mounted upon very short stems, but it failed to yield as much as several of the other varieties, in fact it was one of the lighter yielding ones. This variety is a late maturing strain. The three Russian sorts, Nos. 7, 9 and 10, have made a good showing in their average yield for the past two years. The Argentine strain again failed to yield as much as common flax and that from the Russian selection, while the Siberian strains showed a low average, and the one from the United States Department of Agriculture and numbered by them 8524, again ranked very low in yield, but produced long enough fibre to indicate that it has been bred up for that purpose rather than for the production of seed. In the matter of height and consequent fibre production, however, it fell short of the performance of the Station's selected strain known as No. 15 in the table. It is interesting to note that the taller strains No. 12 Siberian, No. 13 (U. S. Department of Agriculture 8524), and the Station selection known as Selected Riga No. 15, all gave light yields of seed. When the yield of both seed and fibre is taken into account, Siberian flax No. 12 makes a strong showing. A study of the accompanying table indicates that the Russian, Siberian and Argentine importations of flax are not equal to those from the best of the common strains in this district, although the data which it gives covers but two seasons and cannot be taken as final evidence.

MILLET VARIETIES.

Twenty-four samples of millet seed coming from different sources were sown in the variety trial on the fourteenth day of May, 1903. The ground was in good condition and the millet was put in carefully, but owing apparently to cold and backward weather the growth was very scanty. It also seemed to be unfortunate in having its strongest growth period during dry weather, which resulted in its complete failure. The splendid showing which millet for seed and millet for hay have made at this Station during previous years causes the greater surprise that poor results were secured in 1903. Larger areas, which were sown in a field way, also proved a failure, the weed known as pigeon grass or foxtail having crowded in almost to the exclusion of the millet. The fact that our hopes had been built up by the records made with millet during the previous four years make the fact that it proved a failure in 1903 a more important observation than it would otherwise have proved. If millet seed is to prove a failure one year in five, or even one year in ten, it would be poor policy to depend upon it absolutely to furnish either hay or seed for stock food.

VARIETIES OF CORN.

Twenty-two varieties of corn were planted in the Station trials on May 16th, 1903. The land had produced wheat the previous season and was fall plowed. Three days previous to the time of planting it had been disced and harrowed in preparation. The ground was in good condition and the planter was set to put in the corn at a depth of three inches. The planter did a good grade of work and the soil conditions were satisfactory. On the 29th of May, thirteen days after planting, the corn was run over with a peg tooth harrow as a means of cultivating it and of destroying weeds. An iron lever harrow was used for the work, and the teeth were set with a backward slant so as not to dig too much. On the 9th of June it was cultivated with a Planet Junior cultivator and a few of the varieties were thinned to the required number of stalks per hill. It was given subsequent cultivation with the Tower surface cultivator as frequently as was necessary to keep the ground in good condition and free from weeds. On the 16th day of July the different varieties showed a very regular appearance in both growth and stand. The Station No. 100 variety, which represents ten years' breeding from the strain of Minnesota King, and No. 950, a Golden Dent strain, showed much better stands than the other dent varieties, and seem to have succeeded under the surounding conditions which the season allotted them better than did their neighboring sorts.

TABLE XVII.—VARIETIES OF CORN—CROP OF 1903.

Bulletin No.	Variety	Class	Where From	Stand	Stage of Maturity at Frost	Average No. of Stalks Per Hill	Height of Stalk—In.	Height of Ears—In.
100	North Dakota	Yellow dent.	North Dakota Experiment Station	Fair	Milk to dough	1 to 5	52	20
119	Golden Dent	Yellow dent.	Walter Russell, Fargo, N. D.	Fair	Milk to ripe	2 to 4	55	24
158	Fifty Day	Yellow flint.	H. D. Hurley, Duane, N. D.	Good	Silk to milk	2 to 4	65	26
159	North Dakota Yellow	Yellow dent.	Oscar H. Will & Co., Bismarck, N. D.	Good	Milk	1 to 4	67	32
160	Will's Dakota	White flint.	Oscar H. Will & Co., Bismarck, N. D.	Fair	Milk to ripe	1 to 4	41	10
161	Will's Acme	Red dent.	Oscar H. Will & Co., Bismarck, N D.	Poor	Milk to ripe	3 to 5	44	16
162	Will's Gehu	Yellow flint.	Oscar H. Will & Co., Bismarck, N. D.	Poor	Dough to ripe.	2 to 4	41	10
163	Will's Northwestern	Red dent	Oscar H. Will & Co., Bismarck, N. D.	Poor	Milk to ripe	2 to 5	50	16
164	Burleigh County	White flint.	Oscar H. Will & Co., Bismarck, N. D.	Poor	Milk to ripe	2 to 4	43	13
165	Longfellow	Yellow flint.	Northrup, King & Co., Minneapolis, Minn.	Good	Milk to ripe	2 to 5	65	26
166	University No. 13	Yellow dent.	Northrup, King & Co., Minneapolis, Minn.	Good	Milk	1 to 4	75	23
167	King Philip	Red flint	Northrup, King & Co., Minneapolis, Minn.	Good	Milk to ripe	1 to 4	67	24
168	Minnesota King	Yellow dent.	Northrup, King & Co., Minneapolis, Minn.	Poor	Milk to dough	1 to 4	50	23
169	Triumph	Yellow flint.	Northrup, King & Co., Minneapolis, Minn.	Poor	Milk to ripe	2 to 5	55	18
170	White Capped	Yellow dent.	Northrup, King & Co., Minneapolis, Minn.	Very poor.	Silk to milk	1 to 3	60	24
171	Smut Nose	Yellow flint.	Northrup, King & Co., Minneapolis, Minn.	Good	Milk	1 to 4	60	26
172	Pride of the North	Yellow dent.	Northrup, King & Co., Minneapolis, Minn.	Very poor.	Milk to dough	1 to 3	55	26
173	Rustlers White	White dent.	Northrup, King & Co., Minneapolis, Minn.	Very poor.	Milk	1 to 4	70	35
174	Mercer	Yellow flint.	Northrup, King & Co., Minneapolis, Minn.	Fair	Milk to ripe	1 to 5	65	24
175	Minnesota Leanning	Yellow dent.	Northrup, King & Co., Minneapolis, Minn.	Fair	Milk	1 to 5	68	26
176	Evergreen's Sweet	Sweet	Northrup, King & Co., Minneapolis, Minn.	Fair	Silk to milk	1 to 5	70	32
177	Elephant Fodder	Yellow dent.	Northrup, King & Co., Minneapolis, Minn.	Good	Silk	1 to 4	90	45

The flint strains averaged better in appearance than did the dent varieties, and were, as a whole, more advanced in their growth on July 16th. No. 158, fifty-day corn, made an extra good showing at that time and was just beginning to tassel.

No. 162, Will's Gehu, was nearly ripe on September 11th, and a statement was entered in the field record book at that time to the effect that it had the appearance of being the earliest of the entire list of varieties which we had planted. As killing frosts occurred on September 16th, the record entered in the tabular statement presented herewith gives the stage of maturity at that date. From the tabulated facts recorded in this report it will be seen that the later varieties tried in 1903 did not approach maturity. It should perhaps be explained that such expressions as "milk to dough," "silk to milk," "dough to ripe," etc., are expressions which mean the variation which a strain presented on September 16th. The earlier strains are short in stalk and have the ears too close to the ground for convenient and economical harvesting. The variety trials for 1903 harmonize with those of other years in showing that only the older sorts which we have grown in this district have ripened early enough to prove accessions to our list of varieties suited to this district. The trial also seems to indicate that such strains as North Dakota No. 100, Golden Dent, Northwestern or Northwestern Dent, Minnesota King and Acme represent the largest varieties which will prove serviceable in this district. It might also be said that Will's Dakota, Will's Gehu, Longfellow, King Philip, Triumph and Mercer are the flint strains which will prove most satisfactory for this state.

DRILLED CORN COMPARED WITH CORN IN HILLS.

The comparison of corn grown in drills at different distances apart with that of corn grown in hills, the rows standing forty-two and twenty-two inches apart respectively, was carried on in the season of 1903. The trial is really a continuation of one which has been running for six years, and is an interesting one in many of its details. The following systematized information in tabular form gives the yield, height and other points of interest carried out in this trial:

TABLE XVIII.—PLANTING CORN IN HILLS VS. PLANTING CORN IN DRILLS—CROP OF 1903.

Plot No.	How Planted	Height of stalks—In.	Yield Per Acre		Av. Yield Per Acre. Air Dry Fodder	
			Green Fodder—Pounds	Air Dry Fodder—Pounds	For Three Yrs.—Pounds	For Six Yrs.—Pounds
1	Drills 6 inches apart	40	7,436	6,657	7,381	7,251
2	Drills 12 inches apart	42	4,869	5,701	6,512	6,651
3	Drills 18 inches apart	46	*	.....	.....	.....
4	Drills 24 inches apart	52	*	.....	.....	.....
5	Drills 30 inches apart	52	5,023	4,780	6,193	6,152
6	Drills 36 inches apart	55	4,384	4,937	5,929	6,021
7	Drills 42 inches apart	60	*	.....	.....	.....
8	Hills, rows 42 inches apart	58	*	.....	.....	.....
9	Hills, rows 22 inches apart	55	4,551	5,718	.....	6,205

* Samples destroyed by mice.

A consultation of the table shows that corn planted in drills forty-two inches apart with the stalks growing close together in the drill row reached the greatest height of any of the plants and measured exactly five feet. That which was sown in ordinary wheat drills, six inches apart and thick in the row, reached the least height, the stalks measuring three feet and four inches. The gradual increase in height from three and one-third to five feet—the mark which the forty-two-inch trial plot showed—seems a logical result from crowding the thick planted corn together, as it would naturally produce a dwarfing effect. It is interesting to note further that the yield of air dry fodder in the six years' trial is the greatest from plots which were planted in six-inch drills. It is also interesting to note that corn grown in hills where the rows were twenty-two inches apart made a very much better showing than that which was grown in rows forty-two inches apart. Fodder which grew in drill rows thirty and thirty-six inches apart made good yields, and, by reason of growing far enough apart to allow of cultivation, it has an advantage over thickly seeded plots. The cultivation of corn during the growing season will conserve more moisture for the crop than can be done where the drill rows are too closely crowded together to permit the use of a corn cultivator. Thick planted corn has the advantage of producing small stalks which are less harsh than larger growing ones, and on that account are more palatable and surer to be consumed when fed to live stock. It is somewhat difficult to cut and cure corn fodder which has grown in six-inch drills, as no machine seems to work in it satisfactorily, except the ordinary mower, and the large stems contain so much sap that it is hard to dry them out thoroughly enough to make it safe to stack them for fodder.

Another portion of the trial with drilled corn consists of a comparison of corn planted in drill rows, three feet eight inches apart, with

the stalks growing at from six to thirty-six-inch intervals in the drill rows. This trial has been carried on for four years and gives average results that are worthy of careful study. The facts are presented in systematic order in the following tabular form:

TABLE XIX.—THICKNESS OF PLANTING CORN IN DRILL ROWS—CROP OF 1903.

Plot No.	How Planted	Height of Stalk—In.	Length of Ears—In.	Per Cent Ripe Ears	Yield Per Acre		Av. for Four Yrs.	
					Air Dry Fodder—Pounds	Ears—Bushels	Air Dry Fodder—Pounds	Ears—Bushels
1	3⅜ feet by 6 inches	56	5	47.0	6,078	39.1	7,078	34.8
2	3⅜ feet by 10 inches	58	6½	49.7	4,727	32.8	5,642	31.7
3	3⅜ feet by 12 inches	60	6½	44.4	4,457	28.7	5,766	27.9
4	3⅜ feet by 14 inches	60	6½	43.3	6,348	31.3	5,933	26.1
5	3⅜ feet by 16 inches	55	7	38.9	3,647	24.8	4,811	23.3
6	3⅜ feet by 18 inches	60	7	44.7	3,242	25.6	4,296	22.4
7	3⅜ feet by 24 inches	60	6½	48.7	3,242	15.1	3,656	16.4
8	3⅜ feet by 30 inches	55	7	43.7	2,701	20.7	.....	....
9	3⅜ feet by 36 inches	60	7	47.9	2,566	15.7	2,977	....

An inspection of the above table shows a striking contrast in the yield of ears per acre. Beginning with a little over thirty-four bushels of ear corn from drill rows which produced corn stalks at six-inch intervals in the row, we find a gradual decrease in the yield of ears until we reach the plot having an interspace of twenty-four inches between the stalks. The yield of fodder also diminishes, but with a less degree of regularity, as the spaces between the stalks of corn in the row widen. It may also be seen that five to seven inches represent the extreme variation in the length of ears produced, and that there seems to be no evidence of a shortening of stalks which can be charged to thicker seeding. The ears of corn produced were appreciably longer on the thinner planted plots which had the stalks sixteen inches apart in the row than they were upon those that grew stalks of corn thicker than that interspace represents. The differences do not run regularly enough to justify a decided statement of a principle, but it is a significant fact that the thicker planted plots produced ears one and one-half inches shorter on the average than any other corn in the trial, and that the plots having stalks thirty to thirty-six inches apart in the rows produced as long ears as were grown upon any of the plots, and that the plants growing with sixteen and eighteen-inch intervals yielded ears of maximum length.

THICKNESS OF PLANTING CORN IN HILLS.

The best thickness to plant corn in the hill and in the drill row constitute important questions which are yet to be solved for this

district of county. The Station has continued its efforts in that field of investigation and is able to present herewith the results for the season of 1903. It is probable that a vast majority of North Dakota corn growers will find it more advantageous, in the production of different farm crops which go to make up the year's results, to plant corn in hills rather than in drill rows. It is not entirely a question of how much the yield of ear corn or of shelled corn will be, but also a question of destroying weeds and the cultivation effect upon the land, which must be considered.

That it is possible to keep corn which is grown in drill rows clean, cannot be questioned, but whether it is practicable to keep corn planted in drill rows clean, or whether the difference in yield will be large enough to pay for the added cost of hand work, constitutes an important question which must be taken into account. Realizing that a large proportion of the grain growers of North Dakota will continue to grow corn in hills, the Station has undertaken to determine whether thick or thin planting of stalks in a hill is preferable. The following table presents in detail the data secured:

TABLE XX.—NUMBER OF KERNELS IN A HILL—CROP OF 1903.

Plot No.	Number of Stalks	Height of Stalk—In.	Length of Ears—In.	Per Cent Ripe Ears	Yield Per Acre		Av. for Four Yrs.	
					Air Dry Fodder—Pounds	Ears—Bushels	Air Dry Fodder—Pounds	Ears—Bushels
1	One	55	7	45.3	2,785	17.1	3,177	13.7
2	Two	60	7½	48.4	3,713	24.6	3,849	22.2
3	Three	60	6¾	37.3	4,727	31.3	4,621	26.8
4	Four	58	6	32.0	4,322	30.5	5,134	27.6
5	Five	55	5	31.3	5,673	36.9	5,649	30.0
6	Six	55	4½	30.4	5,943	36.8	6,006	32.0

From the above table it will be seen that corn which produced six stalks in a hill gave a higher yield of both ears and fodder per acre—as an average result for four years' trial—than did that which was planted more thinly. It will be noticed, however, that the percentage of ripe corn in the season of 1903 was regularly reduced when the thickess was greater than two stalks in a hill. It will also be noticed that the ears were shortened as the thickness in the hill was increased, making the extreme variation range from four and one-half to seven and one-half inches. It is also interesting to note that the thin planted corn which produced but one stalk in a hill and the thick planting which produced five and six stalks in the hill, measured fifty-five inches in height, while that which produced two and three stalks to the hill measured sixty inches in height

or one-eleventh more than did their neighboring thicker and thinner planted sorts. The size or calibre of the stalks diminish with the thickness of planting. The Station hopes that at some future time it will be able to take up this question and carry it far enough to determine the percentage or the proportion of stalks which cattle will refuse when thick planted and thin planted corn is offered them, and also to determine the amount of dry matter that is produced which cattle will consume and digest. The above results present facts which should be used by the corn growers of the state. The Station cannot say of the thick and thin planting that one is better than the other, as too much depends upon how the grower is situated, but the trial shows that certain results may be expected from thin planting and certain results from thick planting, and the corn grower can understand from the trial what the results will likely be if he adopts one plan or the other.

DATES OF PLANTING CORN IN DRILL ROWS.

The results from two years' work in comparing corn planted at seven day intervals for six weeks following the date of May 18th, are presented herewith. The questions, how late may corn be safely planted for fodder, and what will the exact result be, as measured by the ripeness, the yield of fodder, the percentage of moisture in the crop, the class or grade of grain and fodder, and the difficulties which will be met in caring for and saving the crop, frequently arise among our fodder producers and grain growers. The following table gives the results in detail for both the six-inch and the forty-two-inch drill-rowed plats which constituted the trial:

TABLE XXI.—DIFFERENT DATES OF SOWING CORN—CROP OF 1903.

Plot No.	Date of Planting	Stand	Height of Stalks—In.	Stage of Maturity at Frost Sept. 16	Yield Per Acre			Av. Yield Per Acre For 1902-1903		
					Green Fodder—Pounds	Air Dry Fodder—Pounds	Water in Green Fodder—Per Ct.	Green Fodder—Pounds	Air Dry Fodder—Pounds	Water in Green Fodder—Per Ct.
				SIX-INCH DRILLS.						
1	May 18...	Good.....	36	Silk to milk...	18,945	8,560	60.4	15,652	6,809	62.4
2	May 25...	Good.....	38	Silk to milk...	14,850	5,406	68.1	13,180	4,622	69.5
3	June 1...	Very heavy..	40	Silk	20,565	6,594	71.9	18,231	5,728	72.6
4	June 8...	Very heavy..	45	Silk	22,950	7,228	72.4	16,664	4,887	75.5
5	June 15..	Good.....	40	Silk	20,115	6,105	73.4	17,275	5,087	74.4
6	June 22..	Good.....	45	Silk	21,870	7,782	68.4	.....	.....	....
				FORTY-TWO-INCH DRILLS.						
1	May 18...	Very good...	60	Dough to hard	11,173	*....	....	10,774	.....	....
2	May 25...	Good.....	65	Milk to hard..	11,986	*....	....	10,390	.....	....
3	June 1...	Very heavy..	65	Milk to dough	16,583	6,906	63.5	12,788	4,506	71.5
4	June 8...	Very heavy..	70	Milk.....	16,547	5,094	73.0	10,843	3,122	76.7
5	June 15..	Very heavy..	68	Silk to milk...	16,680	4,720	75.2	12,985	3,696	75.0
6	June 22..	Fair.....	60	Silk	7,284	2,967	64.3	.....	.....	....

* Samples destroyed by mice.

By consulting the table presented above it will be noted that the corn planted May 18th and May 25th, in six-inch drills, reached the silking stage and had a portion of the ears reach the milk stage of growth. It will also be noted that the amount of water which the crop contained on September 16th, when frost cut short its growth period, increased gradually with the lateness of sowing. The results for the season of 1903 were a little irregular in the amount of water which the crop contained, giving the highest percentage of water in the fodder sown June 1st, 8th and 15th. The average results for the two years, however, run nearly uniform. The sample containing the most moisture shows thirteen pounds per hundred more of water, or nearly one-fourth more moisture, which must be dried out in curing the fodder into dry form. It will be noted that the late planted corn from drill rows six inches apart yielded less fodder than the earlier planting, and also that the late planted corn fodder yielded over two and one-third tons of dry matter per acre. Too much importance, however, must not be placed upon the results from two years' work. In this, as in several other trials with corn, the poor facilities which the Station buildings afford for handling experimental fodder and grain, force us to record blank columns, with a foot note giving the information that the samples were destroyed by vermin or by other unavoidable

occurrences. Corn planted in the trial of different dates of seeding in forty-two-inch drill rows, gives much the same comparative results as come from the trial of seeding it in six-inch drills. A greater difference is recorded for the degree of maturity or ripeness of the early and late sown plots. Corn planted in drill rows forty-two inches apart produced a considerable amount of its value in the ears of corn which it formed, and the difference in the stage of maturity of the corn from the different trial plots represents more of feeding value than it does when it is from thicker seeding. The percentage of moisture which the late seeded corn is likely to contain is less a hindrance in the fodder produced from forty-two-inch drills than it is in fodder grown in drills six inches apart. The corn from forty-two-inch drills can be bound, shocked and field cured in the ordinary way without much danger of heating or molding, while corn planted in six-inch drills must be cut down with a mower and allowed to lie in the swath until it has dried sufficiently to permit of stacking. The shorter days and the cooler weather, which come at the season when frosts occur and the crop must be harvested, cause great difficulty in curing and drying out the fodder from thick sown corn. Further comment on this trial will be reserved until the results secured during future seasons may be added to the data which is now at hand.

A CULTIVATION TRIAL WITH CORN.

For four years the Station has carried on a series of cultivation trials as a part of the corn work undertaken. The trials comprise a comparison of deep cultivation, which is commonly produced by using the pointed shovel cultivator during the entire season, with another plot of corn which is cultivated shallow during the first half of the season and cultivated deep with a pointed shovel cultivator during the latter half of the season. A third trial plot was cultivated deep during the first half of the season and shallow during the latter part of the corn cultivating period. The fourth plot in the trial was cultivated with a surface cultivator each time during the season. The corn in all of these trials was planted at the same time and under the same conditions in every way. The following summarized results give in tabular form the facts concerning the trial:

TABLE XXII.—CULTIVATION EXPERIMENTS WITH CORN—CROP OF 1903.

Plot No.	Method of Culture	Height of Stalks—In.	Stage of Maturity at Frost Sept. 16	Per Cent Ripe Ears	Yield Per Acre		Av. For Four Yrs.	
					Air Dry Fodder—Pounds	Ears—Bushels	Air Dry Fodder—Pounds	Ears—Bushels
1	Deep	60	Some hard, mostly dough	34.6	6,280	35.5	4,593	....
2	Shallow, early; deep, late	55	Dough, mostly hard	42.4	6,112	36.4	4,712	....
3	Deep, early; shallow, late	60	Some ripe; dough, mostly hard	45.9	6,171	34.3	4,362	....
4	Shallow	60	Mostly dough; some ripe	47.8	5,977	35.2	5,058	....

From the above table it will be seen that the yield of air dry fodder as an average for the four years gives the greatest results from shallow cultivation. It will also be seen that there was little difference between the other three plots as measured by the yield of air dry fodder. The result of the trial for one of the earlier seasons indicated that deep cultivation late in the season has a tendency to cause an early ripening of the ears, but the results for the season of 1903 indicate that the killing frost which occurred September 16th found the shallow cultivated plot with the largest portion of ripe ears. The plot receiving shallow cultivation during the latter half of the season was next to the shallow cultivated one in the proportion of ripe corn, and the plot which received deep cultivation had only a little over one-third of the ears ripe. The notation in the table should, perhaps, be explained in this connection, as it is difficult to find a short form of wording that will express the idea which the authors had in mind. Such expressions as "dough mostly hard" really means that the most of the ears of corn are in the latter part of the dough stage, or what is called the hard dough stage.

The amount of data which has been secured upon the yield of ears from the different plots is limited, owing to the lack of suitable facilities for drying and curing corn fodder in a place which is free from vermin.

OTHER FORAGE CROPS.

Kaffir corn, amber cane or sorghum, and pencillaria, are three other forage plants which were given a trial in 1903. They were so late in maturing that none of them were headed out on September 16th, when killing frost overtook them. Amber cane gave the greater promise of the three, but none of them were sufficiently successful to be considered competitors of the better strains of corn. The

pencillaria was slightly handicapped by having been planted four days later than the sorghum, Kaffir corn and corn varieties discussed in this report.

VARIETIES OF POTATOES.

Owing to the lack of suitable place for wintering seed potatoes and to the shortage of funds for carrying on experiments with field crops, the trials with potatoes were practically eliminated for the season of 1903. Short rows of each of twenty-two varieties were propagated in order that seed of the better strains which the Station has in stock might be preserved. Owing to the heavy rainfall during the fall season, the potato ground was flooded in irregular spots in such a manner that it was impossible to accurately figure out the yields.

The seed of most of the strains of potatoes which were planted was very scabby. The seed was treated with the formaldehyde treatment and the resulting crop was clean and marketable.

ALFALFA TRIALS.

Turkestan Alfalfa.—The Turkestan strain of alfalfa, seeded in 1901 and reported upon in the Thirteenth Annual Report of this Station, failed to pass the winter of 1902 and 1903 successfully, having been badly winter killed. It was given the most trying conditions by having all of its stem growth mowed close to the ground just before the cold weather of fall began.

A second plot of Turkestan alfalfa, seeded in the spring of 1902, which was left a growth of stems a few inches high, killed but little during the winter.

The question of alfalfa living through the winter seems to be the only serious one to answer relative to its successful production in North Dakota, and the matter of leaving a slight growth of stems in the fall is a simple plan which may prove a remedy for winter killing.

The plots were sown broadcast at the rate of fifteen pounds per acre upon land which had been given a preparation similar to that which is usually made for wheat. The seed was covered by running over the land with a peg-tooth harrow. It was sown at the latter part of the wheat sowing time, upon land which was made free from weeds by a previous thorough harrowing. It is best sown without a nurse crop of any kind, as the young alfalfa plants are rather tender and do not stand crowding.

The mower was run over the field, with the cutting bar set high, frequently enough to prevent the smothering effect of the weeds and to keep the weed seeds from maturing and finding lodgment in the soil.

Grimm Alfalfa.—The Grimm strain of alfalfa, which was sown in 1902 upon ground adjoining the Turkestan trial, has proved

more thrifty and vigorous than the Turkestan strain has done. The Grimm alfalfa filled its seed pods with plump, ripe seed somewhat better than the Turkestan variety, while plants descended from Utah seed yielded an abundance of shriveled and emaciated seed which had little growing strength. The Grimm strain is descended from original plants which had survived for about twenty years in the vicinity of St. Paul, according to the statement of Professor Hays of the Minnesota Station, who brought the seed to the attention of this Station.

This department of the Station proposes to enlarge its work with alfalfa during the coming season, with the hope that it will be able to secure results which will carry it beyond the experimental stage, at which point it must be said to belong at the present time.

RED CLOVER TRIALS.

The trial of clovers from different states and countries, described in the Thirteenth Annual Report, gave some additional data in the season of 1903. The plots have become irregular, owing to the flood in the season of 1902, that data upon the yields made cannot be secured with any considerable degree of accuracy, as some of the plots are so much smaller than others that a comparison could not be considered entirely fair, and the jagged edges and irregular shapes caused by the flood makes the determination of the size of the plots almost impossible. As the chief object of the trial, which is carried on in co-operation with the United States Department of Agriculture in conjunction with Dr. A. J. Pieters, is to learn the degree of hardiness and study the conformation and vigor of the plants, rather than to determine what yield results might be obtained from a field trial, the objects sought are not entirely thwarted. A study of the hardiness and thrift of individual plants has been the chief work of the trial. So far none of the introduced seeds have shown as many favorable characters as the plants which have been produced from seed descended from clover which has been grown in this district for a number of years. The greatest difference in the performance of the plants is noted in the degree of filling and of ripening seed. In the season of 1903, the Minnesota, Michigan and Tennessee strains made the best showing, as measured by the amount of plump and valuable seed produced. In 1902, the Minnesota, Canadian and Tennessee strains were outstanding in the matter of seed production, and it seems probable that the Canadian plot might have repeated its last year's performance this season had it not been accidentally destroyed. As already noted, trials partaking of the nature of the one under discussion require a number of years of record to merit much consideration.

A one-third acre plot, among the rotation trials, which was seeded to clover with wheat as a nurse crop in 1902, made an excellent stand the past season, and had reached a height of twenty inches

on June 25th, upon which date it was harvested. It made a yield of 3,615 pounds of hay per acre, or practically the same as the plot of mixed timothy and clover which grew along side of it, about 400 pounds more than the plot of pure timothy and 400 pounds less than a plot of brome grass. The trial indicates that the plan of sowing clover at the rate of fifteen pounds per acre with a nurse crop of wheat, and harvesting one crop of hay before plowing it under, is the most promising plan for clover growing in the Red River valley. When such a plan is followed the land does not lie idle at all, as a crop of wheat is produced as a nurse crop the season when the clover is seeded. If clover does not "take," the land can be plowed up and put into wheat the next year with only the expense of providing the clover seed and putting it in. The effect on succeeding wheat crops is noticeable in this trial, and indicates that it may be an advisable plan to follow on account of helping to increase the fertility of the soil. The plan outlined seems more promising and practical than an attempt to leave clover for a permanent meadow. The Station has had better success in carrying a crop of clover through the first winter than through succeeding winters, probably owing to the protection of the wheat stubble, and possibly owing to a greater vigor and endurance of young clover plants. The seed used in this trial was that of the common or medium red clover, which was bought on the local seed market and was doubtless grown in the northwest.

OTHER TRIALS.

A number of experiments in animal feeding and pasturing and an extensive one upon the rotation of crops are not in form to offer in this publication, and will be presented at some future time.

J. H. SHEPPERD.
E. G. SCHOLLANDER,

ACKNOWLEDGMENTS.

My thanks are due to Prof. J. C. McDowell for efficient aid in preparing this report.

C. J. Zintheo, formerly Instructor in Farm Mechanics in the College, rendered me aid in investigations reported upon herewith, at various times during the summer of 1903.

I am indebted to Prof. E. S. Keene, of the Mechanical Department of the College, for aid in securing permanent records in the form of photographs of particular features of the work of the past season.

The report of this department is hereby respectfully submitted.

J. H. SHEPPERD.

THE EDGELEY SUB-EXPERIMENT STATION.

To Director J. H. Worst:

SIR: The last legislature appropriated the sum of $5,000 per annum, to be expended in equipping and operating the Sub-Experiment Station at Edgeley, LaMoure county, North Dakota. The Station grounds consist of a quarter section of land, which was donated to the state, about ten years ago, by the citizens of Edgeley and vicinity, to be used for experimental purposes. The last legislature was the first which saw fit to appropriate more than $250 to carry on the work. This amount was found to be wholly inadequate for the needs of the Station in inaugurating a systematic and intelligent line of experiments, which would be of value to the people producing crops in that district.

The radical difference in the climatic and soil conditions of the central and western portion of the state from those prevailing in the Red River valley make the need almost imperative that a system of experiments be made at some point outside the Red River valley, to meet the needs of the producers located in that portion of the state. As the climatic and soil conditions of the country around Edgeley seem similar to those of a vast district in the state, that place was chosen as a suitable location for the Sub-Station. The experiments carried on at the Edgeley Sub-Station should be especially valuable to the farmers of the central and western portions of the state.

In the past little difficulty has been experienced in obtaining an abundant supply of coarse forage and hay from the vast areas of unbroken prairie, but, as the population is rapidly increasing, the time is at hand when much of the wild land will be broken up and turned to the production of other crops. Considerable attention will be given, at this Station, to growing fodder, hay and forage crops, to supplement the restricted acreage of wild hay which a more intensive system of farming has brought about.

The Station is situated in what is sometimes called the semi-arid belt of North Dakota. A series of experiments, constituting a study of promising systems of crop rotation and practical tillage methods for the conservation of soil moisture, should accumulate important data as time passes. The annual rainfall at Edgeley is not very different from that of the Red River valley, but the soil conditions represent such a marked difference that methods of farming which tend to conserve or hold moisture in the soil for the utilization of a crop are of much greater importance to the farmers of that portion of the state.

Barn and Office, Edgeley Sub-Station.

The influence and value of trees and hedges on a farm as a shelter belt and for ornamental purposes can scarcely be estimated in dollars and cents. The Station proposes to give a large amount of attention to the culture of forest, ornamental and fruit trees, in an attempt to determine the ones which are best suited to the climatic and soil conditions of the locality. The culture of small fruits and vegetables is also an important feature that will receive attention.

During the past season, the work has been of a general rather than of a special nature, due to the necessity of equipping the Station at a period late in the spring. The work has been handicapped to a considerable degree by a lack of suitable machinery and through an insufficient number of work horses. When due consideration is given to the necessary outlay for inaugurating and carrying out work of this character, it will be found that $5,000 is a small sum to devote to equipping a station with suitable apparatus, implements, machines, material, buildings, etc. As the work of investigation progresses and broadens, the expense of carrying the plant will doubtless increase proportionately.

At the present time, about ninety acres of the farm are under cultivation, and the remaining portion consists of unbroken prairie sod. All of the cultivated land was cropped during the season of 1903. As no appropriation was available in 1902 to carry on the work started at the Station the previous year, no soil preparation was made for the crop of 1903. The ground had to be plowed and otherwise prepared for seeding after spring opened, which delayed the work considerably. Owing to delay caused by spring plowing and other general preparations, the period of seeding was very late.

GENERAL FIELD WORK.

In the general field work of the past season the plan has been to grow enough feed to supply the needs of the Station live stock during the season of 1904. Fifteen acres were sown to oats, five acres to barley and two acres were sown to emmer or spelt. The land has been cropped continuously for the past twelve or fifteen years without any special regard to retaining the fertility of the soil, hence these crops were necessarily light in yield. About twelve acres were planted to Golden Dent corn on April 27th and 28th. The corn came up well, made an excellent stand and produced a fair quality of fodder. The severe windstorms of early fall, which were prevalent before the corn was harvested, severely injured the crop by stripping off the blades from the stalks, in addition to bending and lodging the stalks in a way which interfered badly with the work of the corn binder. A very small percentage of the corn matured, as it was killed by frost on September 14th. The yield of fodder was estimated at two tons per acre.

Pasture.—Twenty acres was sown to brome grass to provide a permanent pasture for stock. The seed was sown broadcast with an old Superior seeder at the rate of twenty-five pounds per acre. A

light harrow followd the seeder and did good work in covering the seed. The weeds were kept down by the use of a mower at needed intervals. An excellent stand of grass resulted from this method of treatment.

Fencing.—During the past summer almost the entire farm has been enclosed with a fence consisting of three strands of barbed wire. The fencing was deemed necessary to protect outstanding hay stacks and trees from the depredations of stray herds of cattle and horses.

TREES AND HEDGES.

Considerable attention has been given to the culture of trees and hedges during the past season. About 8,000 two-year-old seedling trees were set out upon a plot of two and one-half acres of ground. These include some of the most hardy varieties of forest trees, such as elm, soft maple, box elder and ash.

The seedlings were alternated in such manner as to give them forest conditions. A space of eight feet was left between the rows of trees, and an interspace of two feet was made between the trees in the row. Part of the trees received a heavy mulch of straw immediately after being set out, while the remaining ones were given the best possible shallow cultivation and kept free from weeds during the entire season. The trees on the cultivated portion of the ground appeared to be more thrifty and made more growth than those surrounded by the straw mulch.

A hedge of the Golden Russian willow was started along the west boundary line of the farm from cuttings obtained at the Central Station at Fargo. The cuttings were put in rather late in the season, but they made a fairly good growth, with the exception of a few on the higher portions of the land. These failed to survive.

Fruit Trees.—The varieties of fruit trees, which were obtained from a Minnesota nursery firm, were five years old at the time of setting them out. These included some of the most hardy and popular varieties grown in the northwest. Thirty plum trees were set out, including six of each of the following varieties: Wyant, Forest Garden, Rolling Stone, Desota and Surprise. The apple trees planted include six of each of the following varieties: Duchess, Wealthy, Haas, Hibernal, Lyman's Prolific and Patten's Greening. All of the varieties of apple and plum trees did well, made a good growth and gave promise of being hardy and well adapted to surrounding conditions.

A number of varieties of currant, gooseberry and raspberry bushes were set out at a late period in the spring. This lateness of setting out evidently accounts for the poor showing made by some of the varieties, especially the gooseberries, which made but little progress in growth. The currant and raspberry bushes did exceptionally well.

Tree Planting, First Year, Edgeley Sub-Station.

LAWN AND BUILDING SITE.

About six acres were laid out for a lawn and building site. This ground was sown to brome grass at the time the pasture was seeded. The lawn was sown by hand and possibly a little less seed was used. The brome grass sown upon the lawn, like that seeded for pasture, made an excellent stand. A heavy rain which fell just after the brome grass was sown proved very beneficial in germinating and starting the seed. To beautify the lawn, a number of clumps of trees were planted on it at suitable places. The trees used in this planting include the North Carolina poplar, basswood, elm, etc. A number of Black Hills spruce and some flowering shrubs, such as the snowball, common lilac, Persian lilac, barberry, etc., were used to fill in the clumps. Only two-thirds of the evergreens survived the hot summer winds. C. B. Waldron, Horticulturist of the Central Experiment Station, assumed the responsibility of laying out the lawn and building site, also the planning and direction of the work done with trees and hedges.

BUILDINGS.

To supply the urgent needs of the farm, a barn and a general office building were erected. While plain in their architecture, these buildings are practical in their appointments, and serve the purposes of the Station very well. The office is large enough to supply an office room for the superintendent of the Station, besides three other rooms, which will be used for storing seed, grain samples, etc. This building is twenty feet by twenty-four feet, one story high, and has an elevation of ten feet. The barn is a plain rectangular building, thirty feet by fifty feet, with an elevation of sixteen feet. It is provided with six single stalls for horses, two grain bins ten feet by ten feet, one general tool room ten feet by ten feet, and has in addition a space twenty feet by thirty feet for storing machinery. The hay mow has a storage capacity which will accommodate about twenty tons of hay. Ventilation is provided by a four feet by six feet cupola. The barn is floored with the best grade of fir flooring. A driveway nine feet wide extends the entire length of the building. Both buildings rest on a stone foundation eighteen inches in width.

GRAIN AND FORAGE CROPS.

Brome Grass.—Owing to the cold, late spring and unfavorable season, brome grass did not yield as well as in previous seasons. The brome grass showed its superiority over the wild native grasses in making a growth of four to six inches before the latter had started in the spring. The grass on plot 1 was allowed to ripen its seed, and was cut with a common grain binder July 16th. When threshed at a later period, this plot gave a yield of 300 pounds of seed per acre. The yield of hay was estimated at one and one-quarter tons per acre.

On plot 3 the stand of brome grass was very thin, making a growth of only two and one-half feet, yielding three-fourths ton of hay and 150 pounds of seed per acre. The poor yield of hay and seed on this plot was attributed to a very thin stand, which furnished little shade to the ground. This caused the dry weather to have much greater effect upon it.

Turkestan Alfalfa.—The east half of plot 2, sown to alfalfa in 1901, was a failure the past season, only making a growth of eight inches. The stand was very thin over the entire plot, and the color of the plants was yellow, indicating a weak, unhealthful growth. On July 8th it was nearly all brown and dead, and was cut with a mower. One-half of the hay was left on the ground and one-half removed. This was done in order to note the effect of this treatment upon the following crop of alfalfa. The west half of plot 2, sown to alfalfa in 1902, winter killed almost completely during the past winter. Upon examining the roots of the plants that survived the winter, it was found that many of them possessed tubercles peculiar to the leguminous class of plants. The ground was again plowed in the spring of 1903 and sown to alfalfa. Owing principally to the unfavorable season, the result was again a poor stand.

Timothy.—The timothy sown on plot 9 in 1902 made a good start early in the spring, but proved to be almost a total failure later in the season during the drouthy periods. On July 8th it was noted that the timothy had made a growth of ten inches, and that it had been killed by hot winds previous to that date. About one-half of the timothy was headed at that time, but the heads were very short. The timothy was mowed and one-half left upon the ground, as in the case of the alfalfa.

Corn.—Plots 5 and 9 were planted to corn on May 25th. The land was spring plowed and harrowed twice before planting. A hand planter, regulated to drop from two to four kernels in a hill, was used in the trial. The seed was planted in rows three feet six inches apart, with the hills three feet apart in the row. The corn on plot 5, which grew a crop of corn in 1902, did very poorly during the entire season, while that on plot 9, which produced a crop of wheat in 1902, made an excellent stand and produced a fine quality of fodder.

Flax.—The flax crop on the different plots was very poor. A heavy rain, which fell two days after the flax was sown, probably accounts to a great extent for the poor stand of straw. The rain puddled the soil badly, causing it to form a hard crust over the surface. Upon examination, it was found that many of the flax grains had turned dark in color and failed to germinate, while others were unable to push through the crust of earth. The thin stand allowed the Russian thistle to make a heavy growth, thereby crowding the crop badly and doing much damage to the crop of flax. A comparison of the effect of deep and shallow plowing on the yield of flax is shown in plots 17 and 18. Plot 17 was plowed four inches deep

and plot 18 seven inches. In general appearance, growth and yield there was practically no difference in the two plots. Plot 4, following a crop of wheat, produced about the same yield. Plot 12, sown to flax continually, gave a yield of practically one bushel less per acre than the other two plots. The flax on all of the plots was very uneven and spotted in appearance. No flax wilt was observed.

Rape.—Plot 16 was plowed and sown to rape. This plot was very low and alkaline in spots. The rape was sown with a single disc drill regulated to sow about three pounds of seed per acre. Every fifth drill cup was used, thus making the distance between the rows twenty-four inches. The rape came up well and made an excellent stand. On September 30th it was noted that the rape had made a growth of two feet in height, being large and leafy in character, and almost filled the spaces between the rows. The rape received three cultivations at needed intervals. A small shovel one-horse cultivator was used in cultivating it. The yield per acre was estimated at ten tons.

A comparison of the results obtained in this experiment with those of previous seasons made at the Station clearly demonstrates the value of rape as a forage crop for the central and western part of the state. The Central Station at Fargo has already shown the value of rape for the Red River valley.

Millet.—Plot 15, which had grown a crop of oats in 1902, was sown to millet (Siberian) on May 29th, with a Monitor shoe drill set to sow one-half bushel of seed per acre. The millet made fair growth, but was killed by the heavy frost on September 14th before much of it had headed out. The yield was estimated at two and one-half tons per acre.

Wheat.—Plots 7 and 8 were sown to wheat on April 26th. The land was harrowed twice before and once after seeding. This was a trial to show the effects of deep and shallow plowing on the crop. Plot 7 was plowed four inches deep, and plot 8 seven inches deep. Both plots received the same treatment at seeding time, and were sown at the rate of one and one-fourth bushels of seed per acre. Close observation, during the entire period of growth and at the time of harvesting, failed to show any marked difference in the grain growing on the two plots, except that plot 7 appeared to be somewhat better filled than plot 8. These plots were ripe and harvested on August 11th. A comparison of the yield of the two plots shows a difference of seven-tenths of a bushels in favor of the shallower plowing.

Plots 11, 13 and 14 were sown to wheat April 26th. A Monitor shoe drill was used, which was regulated to sow one and one-fourth bushels per acre. These plots grew the following crops in 1902: Plot 11 is a wheat continuous plot; plot 13, wheat; plot 14, millet. The wheat continuous plot has not been in the trial a sufficient length of time to show any marked effect upon the yield.

Table VII gives the data and yield for the grain and forage crops:

TABLE VII.—GRAIN AND FORAGE CROPS, GROWN IN A ROTATION TRIAL.

Plot No.	Crop Grown	Days Maturing	Length of Straw	Length of Head—In.	When Harvested	Yield Per Acre
1	Brome grass	....	3 feet....	6 inches..	July 16..	1¼ tons.
2	Turkestan alfalfa	....	8 inches..	.....	.....	½ ton.
3	Brome grass	....	2½ feet..	6 inches..	July 16..	¾ ton.
5	Minnesota King corn	....	3½ feet..	.....	Sept. 20..	1½ t'ns fodd'r.
6	Common flax	90	20 inches	.....	Aug. 18..	6 bu. 49 lbs.
7	Wheat	108	2¼ feet..	.....	Aug. 11..	17.28 bu.
8	Wheat	108	2½ feet..	.....	Aug. 11..	16.57 bu.
9	Corn	....	3½ feet..	.....	Sept. 20..	2 tons.
10	Timothy	....	10 inches	.....	.....	¼ ton.
11	Wheat continuous	96	2½ feet..	3 inches..	Aug. 6..	15.68 bu.
12	Flax continuous	90	2½ feet..	3½ inch's	Aug. 18..	5.34 bu.
13	Wheat	102	2 feet....	2½ inch's	Aug. 5...	15.17 bu.
14	Wheat	102	2 feet....	2½ inch's	Aug. 5...	16.55 bu.
15	Millet	....	2 feet....	.....	Sept. 15..	2½ tons.
17	Common flax	90	20 inches	.....	Aug. 18..	6.57 bu.
18	Common flax	90	20 inches	.....	Aug. 18..	6.32 bu.
22	Rape	....	2 feet....	.....	.....	10 tons.

VARIETIES OF WHEAT.

Nine varieties of wheat were grown in the trial in 1903. These varieties were selected from the Central Station at Fargo as promising varieties for the central and western portions of the state. The land used in the trial was summer fallowed in 1902, and was prepared for the crop by double discing and harrowing twice before the seed was sown. On April 24th the grain was sown with a Monitor shoe drill regulated to sow five pecks per acre for the fife and blue stem and six pecks per acre of macaroni seed. All of the seed was given formaldehyde treatment for smut. As the grain was somewhat swollen at the time of seeding, due to the formaldehyde treatment, allowance was made for the increase in bulk by measuring a bushel before and after treating. Owing to the late, cold spring, the wheat was slow in coming up, but stooled well and made an excellent stand. During the entire season the macaroni varieties had the appearance of being more thrifty than either the fife or blue stem, and they were not so badly affected by drouth. This difference was especially noticeable during the earlier and later periods of growth, during which time the rainfall was light and irregular. The macaroni wheat was less affected by the hot winds at the time of filling than were the fife and blue stem strains. During drouthy periods the fife and blue stem burned out badly in spots, and the straw became very brittle and brown in appearance upon the affected patches, while the macaroni maintained a more healthful appearance. These drouthy spots were distinctly noticeable during the growing season of 1903 over the entire farm and also

upon adjoining land, and wherever they occurred the grain had immature straw and carried short heads, which were only filled with shrunken kernels.

The following table gives the data and yield for the varieties of wheat in 1903:

TABLE I—VARIETIES OF WHEAT.

Variety	Class	Where From	Days Maturing	Length of Stem—In.	Bearded, Smooth or Velvety	Length of Heads—In.	Weight Per Bushel—Pounds	Yield Per Acre—Bu.
Minnesota 169	Blue stem	North Dakota Experiment Station	108	36	Velvety	3¼	56½	15.06
Haynes' Selected	Blue stem	North Dakota Experiment Station	106	36	Velvety	3¼	58	15.74
Rysting's Fife	Fife	North Dakota Experiment Station	101	34	Smooth	3½	56	19.74
Minnesota 163	Fife	North Dakota Experiment Station	101	32	Smooth	3	58	17.06
Aronautka	Macaroni	L. A. Ueland, Edgeley, N. D.	97	32	Bearded	2¼	58	19.38
Kubanka	Macaroni	North Dakota Experiment Station	97	32	Bearded	2	60	18.22
Pererodka	Macaroni	North Dakota Experiment Station	97	36	Bearded	2¼	61½	21.41
Velvet Don	Macaroni	North Dakota Experiment Station	97	34	Bearded	2¼	61½	20.32
Yellow Gharnovka	Macaroni	North Dakota Experiment Station	97	34	Bearded	2¼	61½	20.59

The macaroni varieties were ripe and harvested on August 3d. Judging from the general appearance, viz., stand, stooling and filling at that time, the varieties stood in the following order: Rererodka, first; Velvet Don, second; Yellow Gharnovka, third; Kubanka, fourth; Aronautka, fifth. The Aronautka contained a mixture of about 10 per cent of fife heads, which might reduce the yield somewhat. The heads of the macaroni varieties were short but well filled.

Rysting's fife was ripe and harvested August 4th; Minnesota 163 (fife), August 7th; Haynes' selected blue stem, August 12th; No. 169 (blue stem), August 14th.

Table II gives the comparative yield between the two best yielding varieties of macaroni, the two varieties of fife and the two varieties of blue stem:

TABLE II.—SHOWING COMPARATIVE YIELD OF BLUE STEM, FIFE AND MACARONI WHEAT.

Class	Yield Per Acre—Bu.	Difference —Bu.
Macaroni	21.0	
Fife	18.40	2.60
Blue stem	15.40	5.60

It will be observed that the macaroni strains yielded two and six-tenths bushels more per acre than the fife, and five and six-tenths bushels per acre more than the blue stem. It will also be noticed that the fife yielded three bushels more per acre than the blue stem. There was little difference in the grade of fife and blue stem wheat, as both were badly shrunken.

Macaroni wheat seems to be particularly adapted to the central and western portion of North Dakota. The results of trials at the Edgeley Station indicate a superior yielding capacity and a power to resist drouth and hot winds. The discrimination made against it by the millers and elevator men is gradually being overcome as the value of macaroni flour becomes more widely known.

VARIETIES OF OATS.

Five varieties of oats were grown in the trial of 1903. The varieties used in the trial, with the exception of one sort, were obtained from the Central Station at Fargo, and include some of the earliest and best yielding varieties grown there. The Swedish select oat is a variety recently imported from Russia. All of the varieties were sown April 28th on land that had grown a crop of corn in 1902. On account of weeds which sprang from seed that matured the previous season, it was deemed advisable to plow the land before sowing the oats. A low, wet swale which passed through the central part of this plot, caused that portion to be unsuitable for the trial, as it was too wet to be properly tilled. The ground was harrowed twice before seeding. A Monitor shoe drill, set to sow oats at the rate of two bushels per acre, was used. This drill was provided

with chains and did good work in covering the grain. The oats stooled well, except in the low portion of the plot, and made an excellent stand. Upon the low land the stand was very uneven. None of the strains of oats rusted seriously enough to damage the crop.

The oats were ripe and harvested on the following dates: Sixty Day oat, July 20th; Swedish Select oat, July 30th; Minnesota 202 and Siberian White, August 3d; Select Tartarian, August 11th.

Table III gives the data and comparative yield of the different varieties:

TABLE III.—VARIETIES OF OATS.

Variety	Where From	Days Maturing	Length of Straw—In.	Form of Head	Length of Head—In.	Color of Berry	Size of Berry	Shape of Berry	Wt. Per Bu.—Lbs.	Yield Per Acre—Bu.
Minnesota 202.....	North Dakota Exp. Station....	97	36	Whorled	7½	Light Yel....	Medium small..	Short; slender..	35	43 56
Siberian White.....	North Dakota Exp. Station....	97	36	Whorled	7½	White	Medium large...	Medium long....	34	46 28
Sixty Day Oat.....	North Dakota Exp. Station....	83	36	Whorled	6	Yellow	Medium small...	Medium short...	34	37 02
Select Tartarian....	North Dakota Exp. Station....	105	36	Side	8	White	Medium large...	Medium long....	37	31 94
Swedish Select.....	Russia	93	33	Whorled	6½	White	Large; plump..	Short; plump...	38	41 38

It will be noticed that the varieties having a medium season of growth gave the largest yield of grain, the earliest maturing strain second and the latest maturing third. General conclusions cannot be formulated upon the results secured from one season's work, as further trials may produce different results.

The variety known as Swedish Select gave very promising evidence of becoming one of the best strains. It produced a stiff straw of good height, had well filled heads with large plump kernels and ranked first in weight per bushel.

VARIETIES OF BARLEY.

Four varieties of barley were grown upon the trial plots of the Station in 1903. The land upon which the trial was made grew a crop of corn in 1902. All of the varieties were previously treated for smut with the formaldehyde treatment, and were seeded on April 28th with a Monitor shoe drill regulated to sow at the rate of two bushels per acre. The barley made a fairly good stand, but, like other grains, suffered from a lack of moisture at a critical period of growth, which caused the straw to be very short and brittle at the time of cutting and most of the heads were poorly filled. The kernels in the Manscheuri and Six-Rowed Mansury varieties were somewhat under size. McEwan's Hulless, Manscheuri and the Six-Rowed Mansury were ripe and harvested on July 30th. All of the varieties were practically free from rust.

Table IV gives the data and yield for the different varieties:

TABLE IV.—VARIETIES OF BARLEY.

Variety	Where From	Days Maturing	Length of Straw—In.	Length of Head—In.	No. Rows Per Head	Length of Beard—In.	Size of Berry	Color of Berry	Wt. Per Bu.—Lbs.	Yield Per Acre—Bu.
McEvan's Hulless	North Dakota Experiment Station	86	21	3½	2	3¼	Very large	Brown	55	21.14
Manscheuri	North Dakota Experiment Station	86	28	3	6	3½	Medium	Yellow	43	22.14
Two-rowed Mansury	North Dakota Experiment Station	93	24	2½	2	3	Large	Yellow	45	22.51
Six-rowed Mansury	North Dakota Experiment Station	86	30	3	6	3	Medium	Yellow	44	24.59

While there was no marked difference in the yield of the different sorts, the Six-Rowed Mansury appeared to lead in productiveness and length of straw, and showed a more healthful growth than did the other varieties.

VARIETIES OF MILLET.

Five varieties of millet were grown in this trial. The land was plowed on May 14th and harrowed twice immediately afterward. On May 29th the ground was again harrowed, and the varieties of millet were sown with a Monitor shoe drill regulated to sow one-half bushel of seed per acre of the smaller kinds. The New Japanese strains were sown at the rate of three pecks per acre, the Red Veronezh at the rate of four pecks per acre. The ground was very dry at the time the millet was sown. Continuous dry weather after the millet was sown caused it to make a very poor stand. A vigorous growth of Russian thistles and other weeds seriously damaged the crop.

Table V gives the data and comparative yields of the different varieties:

TABLE V.—VARIETIES OF MILLET.

Variety	Where From	Height of Straw—In.	Length of Head—In.	Kind of Head	Yield of Fodder in Tons Per Acre
New Japanese	Northrup, King & Co.	32	*	Cocksfoot	1.96
Red Veronezh	Northrup, King & Co.	42	*	Brome	3.39
Early Fortune	Northrup, King & Co.	28	6	Close brome	1.96
German millet	Northrup, King & Co.	24	*	Foxtail	2.50
Siberian	Northrup, King & Co.	24	2½	Foxtail	2.30

* Did not head out.

The season of 1903 proved to be very adverse to the growth of millet. Light frosts occurred on July 29th and 30th which injured the crop badly, and especially that which was sown on low ground. Early Fortune was the only variety to ripen its seed. This variety was harvested with a binder September 12th. The other varieties were killed before the stage of maturity by a frost on September 14th, at which time they were cut for hay.

The Siberian and German varieties were fine stemmed and leafy in character and made an excellent quality of hay. New Japanese and Red Veronezh were coarse and harsh. Of the list of varieties grown, the Siberian and German seem to lead in the production of fine leafy hay of a quality most suitable for feeding to live stock.

VARIETIES OF CORN.

Nine varieties of corn were grown on the trial plots in 1903. The land had grown a crop of wheat in 1902, and was spring plowed four inches deep and harrowed three times before planting. On June 2d the seed was planted in hills three and one-half feet apart each way. A hand planter, regulated to drop from two to four kernels in a hill, was used in the trial. The thorough harrowing of the ground just previous to planting the corn effectually destroyed a crop of weeds and simplified the matter of subsequent cultivation to a great extent. On account of the cold spring, the corn was slow in coming up.

The corn received the following cultivation:

June 3d, harrowed once immediately after planting.

June 17th, harrowed over with a common peg-tooth harrow.

June 22d, cultivated with a Deere six-shovel cultivator.

June 30th, cultivated with a Deere six-shovel cultivator.

July 10th, cultivated with a Deer surface (blades) cultivator.

July 20th, cultivated with a Deere surface (blades) cultivator.

The corn was greatly retarded in growth during the early part of the season by cold weather and a lack of moisture. Heavy rains later in the season stimulated growth to such an extent that the corn was immature when killing frost occurred on September 11th. Owing to the immature state of the corn and a lack of scales, accurate results could not be obtained, and no weighed yields of fodder or ears were recorded. An estimate, however, was made at the time of cutting and the yields for the smaller varieties were placed at one and one-half to two tons and that of the larger kinds at from two to three tons of fodder per acre.

Table VI gives the data and yield of the different varieties of corn:

TABLE VI.—VARI ETIES OF CORN.

Variety	Class	Where From	Stand	Stage of Maturity at Frost	Av. No. Stalks Per Hill	Height of Stalks—Feet
Will's Dakota	Flint	Oscar H. Will & Co., Bismarck, N. D.	Good	Dough to hard	2 to 3	3½
Northwestern Dent	Dent	Oscar H. Will & Co., Bismarck, N. D.	Good	Dough to hard	2 to 3	4½
Acme Fodder	Dent	Oscar H. Will & Co., Bismarck, N. D.	Good	Milk to dough	2 to 4	3½
Gehu	Flint	Oscar H. Will & Co., Bismarck, N. D.	Good	Dough to hard	2 to 3	3½
Mercer	Flint	Northrup, King & Co.	Good	Milk to dough	2 to 3	4½
N. K. & Co.'s Triumph	Flint	Northrup, King & Co.	Good	Milk to dough	1 to 3	5½
Pride of the North	Dent	Northrup, King & Co.	Good	Kernels just forming.	1 to 3	6
University	Dent	Northrup, King & Co.	Fair	Kernels just forming.	1 to 3	6½
Minnesota King	Dent	Northrup, King & Co.	Good	Milk to dough	2 to 3	4½
Sorghum	Early amber	Northrup, King & Co.	Good	20 per ct. headed out	2 to 6	5

It will be noticed that the Pride of the North, Triumph and University produced the greatest height of stalks. This fact should be kept in mind when choosing a variety for a fodder crop, as a corn binder can be used to much greater advantage in harvesting the large sorts than it can in securing the smaller varieties. The Northwestern Dent, Mercer and Minnesota King come next in order in height of stalks.

Considerable difficulty was experienced in cutting some of the earlier small growing varieties with a corn binder, as their habit of growth placed the ears very close to the ground and it was impossible to set the machine low enough to save them.

Sorghum.—A few rows of sorghum or sugar cane were given a trial at the Station. The same methods of preparation of soil, planting in hills, etc., were followed as have been described for the varieties of corn. The sorghum was planted by hand at the rate of four to six seeds per hill. The light frosts which occurred on July 29th and 30th injured the sorghum to a considerable extent, but it recovered at a later period and produced a fodder very leafy in character and fine in quality. The sorghum was killed by frost on September 14th before reaching maturity. About 20 per cent of it was headed at that time. Strong fall winds stripped the hilled corn of its blades, but did not seem to affect the sorghum much. In this limited trial the sorghum has shown its strong drouth resisting qualities, which indicate that it has a probable value as a fodder crop for the portion of North Dakota represented by the Edgeley Station.

ACKNOWLEDGMENTS.

Mr. B. N. Stone, a member of the board of directors of the Agricultural College, deserves much credit for the valuable assistance he has given in the work of equipping the Station.

Hon. C. H. Sheils and other merchants of Edgeley have aided in a material way by supplying the Station with needful machinery at a very reasonable price. They have also shown their appreciation of the work by the keen interest manifested and the encouragement given to those in charge.

Mr. J. M. Plott has given valuable assistance in many ways by supplying machinery, furnishing boarding for the farm help, stable room, etc.

Respectfully submitted,

O. A. THOMPSON,
Superintendent.

J. H. SHEPPERD,
Vice-Director.

DEPARTMENT OF HORTICULTURE.

To J. H. Worst, Director:

The work in the Horticultural Department for 1903 was the same as for previous years, except that a more extended trial with small fruits and experimental tree planting, to determine the best arrangement and distance of planting for the several species, was started both at Fargo and at Edgeley.

At Edgeley three acres were planted, using elm, silver maple, white ash and box elder. These were all planted two by eight feet apart, using as many box elder as of all the other trees together, and as many silver maple as of both ash and elm, of which an equal number was used.

The trees planted earliest in the spring made much the best start, but the growth of all was fairly good. They were all kept cultivated during May and June, when a block was set aside and mulched with straw as a further experiment.

In addition to this planting, in which all the trees were seedlings, a limited number of Carolina poplars, basswood and Black Hills spruce were planted for ornamental purposes.

The further planting at Edgeley was of several varieties of apples, plums, raspberries, currants and gooseberries, as well as of several ornamental plants. These included the lilacs, spineas, barberry, snowball, peonies, etc. As a rule the stock made a very satisfactory growth for the first year.

The planting at that station should be largely extended the coming season, to determine as rapidly as possible the varieties and methods best adapted to a region where tree growing is sure to prove more difficult than where our previous trials have been made.

In the tree plantation at Fargo the same varieties were used as at Edgeley, but with a slightly different arrangement.

The seedlings planted in 1902 were badly killed during the past winter. The box elders suffered the most, but few being alive in the spring. This was probably due to too rapid a growth the first season, due to the heavy, late summer rains. They probably would have done better if the land had been seeded to oats late in July. These would have dried out the soil and checked the growth of the trees.

The white ash grove shown in the cut received no cultivation except once early in the spring. While the trees have made a very good growth, many of them being twenty-five feet high at the end of twelve years, yet this grove would be much better if it were partly made up of elm and silver maple.

The ash is slow to leave out in the spring and sheds its foliage early in the fall. This allows enough light in the grove in spring and fall to encourage the growth of foxtail and other weeds to some extent.

The silver maple makes so dense a shade throughout the entire season that the weeds and grass cannot get started. In the shelter belts it is proving itself to be the best tree we have. After the first few years its growth is very rapid, and so heavy and dense that it affords the best possible shelter.

The red cedars planted in 1902 practically all lived, none of them winter killing. They made a fine growth of nearly a foot in 1903, showing that in some seasons they are hardier than some of our standard deciduous trees.

As they grow wild by the thousand in the western part of the state, it is fair to suppose that they will succeed wherever they are properly planted and cared for.

THE PLUM ORCHARD.

The winter of 1902 and 1903 killed a large part of the young plum trees that were just coming into bearing. This was probably due to the wet weather in August and September, on which account they did not have an opportunity to properly ripen their wood. This shows the necessity of a cover crop in seasons of excessive rainfall. The remaining trees were so badly blown over by the heavy fall winds, coming when the ground was very wet, that they were all removed to a place affording better protection. It was the first time that fall planting has been attempted with us to any extent, and this experiment will be carefully noted.

APPLES.

The apple trees were injured less by the winter than the plums, and much less than the box elders. Five varieties fruited. The Lyman's Prolific and the Hibernal present the best appearance at the present time. Both of these varieties fruited. About 150 trees were taken from the nursery now and planted in the orchard last fall. A part of them were set in clover sod, and these trees will be cultivated or mulched for a small space about each tree as a comparison with the portion of the orchard where the entire surface will be kept cultivated.

STRAWBERRIES.

In the trial bed of strawberries thirty-five kinds were tried and records kept of each. In the large bed the best varieties are grown, and here trials were made of the different times of planting and, incidentally, of the effects of mulching compared with cultivation.

Another bed is being allowed to stand for a series of years to see how long it will continue profitable. As no rain fell to wet the soil

from the time the plants blossomed until the fruit was harvested, the season was a trying one, but the crop was far from a failure. When the mulch was allowed to lie about the plants, the soil remained mellow and moist, and the lack of rainfall was hardly apparent.

Plants set as late as September made a good growth and produced some fruit last season, though not as much as was expected. It is probably not advisable to set plants at that season unless one has the plants at hand and the season is very favorable.

The old bed produced its third crop last season, and considering the season did remarkably well.

In the trial bed the Warfield gave the heaviest yield, followed in order by the Tennessee Prolific, Emperor, Senator Dunlap, Sample, Wm. Belt, Beder Wood, Drouth King and New York. Several other varieties did nearly as well.

The success of strawberry culture, aside from planting hardy and prolific varieties, depends upon protecting the beds from the south winds and in keeping the soil mellow and moist by cultivating well after the fruit is gathered, and keeping it covered with straw during the blossoming and fruiting season. The plants must not be allowed to become too thick where the moisture is deficient.

CURRANTS AND GOOSEBERRIES.

So much assistance was given by the public in harvesting this fruit that no record was kept. The London Market is easily the most productive and satisfactory of all the currants that we have tried.

RASPBERRIES.

The location of the raspbery bed is not favorable, the soil being too heavy and poorly drained. The Cardinal and Colorado Ironclad were the only ones making at all a favorable showing.

ASPARAGUS.

In 1902 measures were adopted to check if possible the asparagus rust, that was so bad that season as to threaten the complete destruction of the plants.

The upper portion of the plants was all killed in August. At that time they were cut down and the bed was covered heavily with straw. The wet weather caused the straw to rot, with the result that the rust spores were practically all destroyed. In the season of 1903 no rust showed till very late in the season. It then put in its appearance at one end of the bed, and may have been introduced from some outside source. It was noticed that beds which were not covered with straw began rusting very badly, the portion of the plants above ground being killed in July and August. The same treatment was applied at the close of last season. Two new varieties, supposed to be more or less immune to the rust, were also planted. They showed no sign of rusting the first season.

VEGETABLES.

About two acres of vegetables were grown, chiefly to make a demonstration for the benefit of visitors. As in previous seasons, selections were made with a view to improving sweet corn, tomatoes and melons, particularly in the matter of earliness.

EQUIPMENT.

For the purposes of instruction as well as for experiment the Department should be equipped with larger greenhouses and with demonstration rooms. Most of the instruction to students is given in winter, and without means to illustrate the different processes, such as transplanting, pruning, grafting, cross fertilizing, etc., the work is necessarily without the interest and practical value that it should have. As the state becomes settled and homes are improved, the demand for this kind of instruction is rapidly becoming more imperative, and should be met as soon as possible.

BULLETINS.

Bulletin No. 59, devoted to the general subject of tree and fruit culture, has been prepared and is being sent out for the season of 1904.

Respectfully submitted,

C. B. WALDRON.

VETERINARY DEPARTMENT.

J. H. Worst, LL.D., Director:

SIR: During the short space of time since a Veterinary Department has been added to the Experiment Station, its work has principally consisted in making such field and laboratory observations on the various live stock diseases of the state as may be used as a base for lines of experimental work whenever the Department will be provided with the equipments necessary for such a task.

While this work covered almost anything that presented itself, a number of facts have been gathered, which although disconnected, will prove of considerable value when more sharply defined research work can be begun.

Some active work, however, has been done.

The existence of a parasitic skin disease, known as scab or scabies, among the Station cattle made vigorous means of eradication necessary.

As the conditions under which cattle are kept on the Station are in a large degree similar to those which prevail on ordinary farms, it was deemed wise to take advantage of our misfortune in order to devise a method of scab eradication which could be profitably employed by those engaged in the cattle industry on a small scale.

The only method of treating or eradicating scab which is recognized as efficient by competent observers is the one known as dipping. This consists of the total immersion of the affected animal in a solution of the parasiticide to be employed.

While this mode of treatment is essentially the same as that employed in the eradication of a similar disease of sheep, it is needless to say that in the case of cattle special apparatus is required, as the great weight and size makes the manipulation by hand impossible.

Two types of dipping apparatus are in use. In one, used for dipping large herds, the animals are driven through the vat in which the solution is contained. The vat is sunk in the ground, and is provided with a slide or trap by which the animals are plunged into the solution, and an incline at the exit in order to enable them to walk out of the tank.

The second type is especially designed for dipping on a smaller scale, and consists of a small vat, also sunk in the ground, a movable cage for the animal and a derrick by which the cage is lowered or raised into or out of the tank. An excellent description of such an outfit is found in B. A. I. Bulletin No. 40. The dipping plant mentioned in this bulletin is a stationary structure, and is admirably

Dipping Apparatus—Engine and Tank

adapted for work on a small or medium scale. Its stationary character, while not a serious disadvantage, has a tendency to limit its usefulness.

While the opportunity presented itself, and while the Station was compelled to dip its cattle, an experiment was carried on with a view to ascertaining if a dipping outfit could be made which could be readily transported.

It was not found difficult to construct the derrick and the cage in such a manner as to allow them to be easily taken apart. In the tank proper this could not be easily accomplished, as the fact of it having to be watertight is not compatible with temporary structure. Furthermore, if the transportable tank could be constructed, such an apparaus would always be bulky and apt to be injured when taken out of the ground and during transportation.

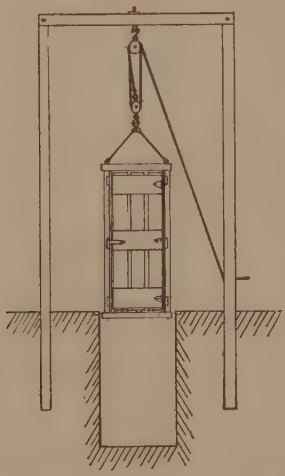


Fig. 4. Derrick, block and tackle and cage.

For the reasons mentioned a tank was tried made of canvas, and it was found that wherever the use of a movable tank is indicated that this material offers special advantages.

The tank used in this experiment was made by Messrs. Beck and Wright, of Moorhead, Minn., under the direction of this Department, at a cost of $15. It proved to be perfectly watertight, and was in no way injured by the dipping fluid used (Formula No. 3, South African lime and sulphur dip).

Before deciding on canvas as a material for the construction of a dipping vat, the effects of the lime and sulphur compound on the fabric were studied by laboratory experiments. Various samples of canvas were boiled for several hours in the nonsedimented lime and sulphur mixture, and no injurious results could be noticed.

It was hoped that the tank could be lowered in an accurately dug pit without any further preparation. This, however, was not possible owing to the caving of the soil in this section of the state, and it was necessary to provide the excavation with curbing. For this purpose some old lumber was used, such as may be found on almost any farm yard.

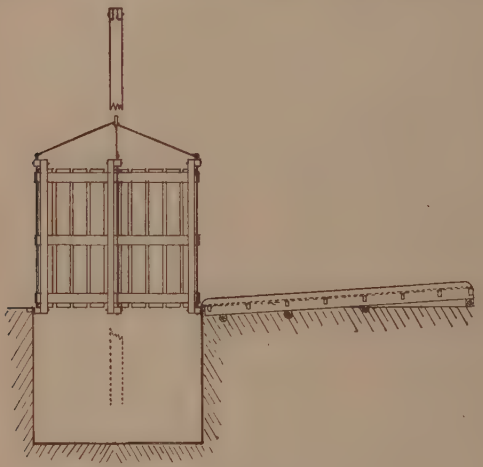


Fig. 5. Side view of cage, derrick, tank and dripping floor.

Considering the nature of the soil in the higher portions of the state, the writer feels quite certain that curbing will not always be necessary. This opinion, howeyer, is not based upon actual observation.

Fig. 6. Construction of cage floor and dripping floor.

Dipping Tank, Animal in Tank

The canvas bag is lowered into the pit, and its walls kept upright and smooth by lacing its upper edge to a two by four placed around the pit in the manner shown in Fig. 3.

After the tank was used, it was cleaned and permitted to dry, when it was rolled up and stored by hanging it to a rafter in a barn so that it may not be injured by rodents.

The cage, derrick and the combined guiding slide and stop were so constructed that by loosening a few bolts they could be easily taken apart.

The dripping floor can be moved without being taken to pieces. (For construction see illustrations.)

For the approaches rough fencing was used, such as is commonly used on farms for the construction of corrals, etc.

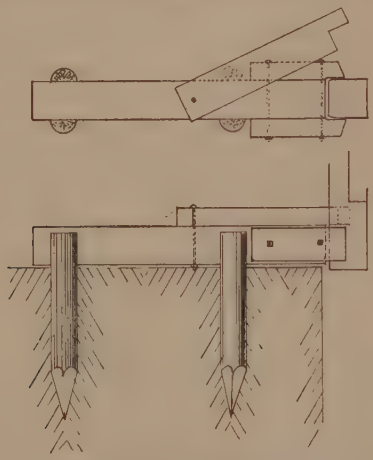


Fig. 7. Construction of guiding slide and brake.

The cost of the construction of this transportable dipping plant was as follows:

Lumber	$25.51
Hardware	7.01
Block, tackle and rope	6.60
Canvas tank	15.00
Labor	13.50
Total	$67.12

The cost of the dipping fluid is about $14 per vat, and this will be amply sufficient for one day's dipping. During our experiments it was estimated that 150 head of cattle could be dipped in one day.

While the opportunity presented itself some observations were made on the effect of lime and sulphur dip on the quality of the wool of sheep, and for this reason the Station flock was dipped twice

during the spring and once during the fall. The first dipping took place shortly after shearing, and the last one when the fleece was about one and a half inches in thickness.

After the last dipping samples of the wool were taken. In order to obtain expert opinion on the samples, one was sent to the Bureau of Animal Industry, Washington, D. C., by which it was referred to a New England wool expert. Another was submitted to the North Star Woolen Mills of Minneapolis. The following replies were received:

MINNEAPOLIS, Minn., January 18, 1904.

Prof. L. Van Es, North Dakota Agricultural College:

DEAR SIR: We acknowledge receipt of your favor of the 13th inst., also sample of wool. This wool is of good character and well bred. We cannot notice any bad effects from being dipped. The wool washes out white, but is a little harsh, which is the only fault we could find, and this is not serious. The sample shows more strength of fibre than the average lots received by us. We shall be pleased to give you any further information, if desired.

Yours truly,
NORTH STAR WOOLEN MILL CO.
(Signed) PARK W. PECK,
Treasurer.

BUREAU OF ANIMAL INDUSTRY,
WASHINGTON, D. C., January 29, 1904.

Prof. L. Van Es, Agricultural College, N. D.:

DEAR SIR: In accordance with my letter to you of the 21st inst., I now have some data from New England with reference to the sample of wool which you sent to this Bureau, and which was forwarded to a leading manufacturer of wool fabrics at Sanford, Me. The expert there reports that, so far as he was able to determine with the naked eye, the dip had not injured the fibre in any way. He states that at first sight he thought perhaps it showed a little tenderness near the point, but after going into the matter further and comparing it with undipped wools in stock, he reported that he could not see that it showed any less strength than wools which have not been dipped at all. The gentleman who had the sample in charge, with the desire to have corroborative judgment, took the wool to Boston and placed it in the hands of a gentleman whom he reports as an expert of first rank. After examination, this expert says "he could not see that the dip had injured the fibre at all." When asked if he did not think the top end of the fibre was not as strong as the other end, he replied that all wools show less strength at this end than at the base. He considered "the wool all right in every way." The names of these experts are not in my possession, but I am assured that they have the entire confidence of the wool manufacturers of New England, and it is one of these manufacturers who has kindly given this information for this letter.

Respectfully
(Signed) D. E. SALMON,
Chief of Bureau.

From the letters quoted above it seems that lime and sulphur dip does not injure the wool, as has been frequently stated by those who are interested in the manufacture and sale of patent dips.

Dipping Tank, After Dipping

The dip used was the same as is recommended for cattle, and contains a larger proportion of lime than the lime and sulphur dip designed for sheep. It is therefore quite reasonable to presume that if the stronger cattle dip does not injure the wool, wool growers have nothing to fear from the use of the lime and sulphur sheep dip.

Co-operating with Prof. L. R. Waldron, Assistant Botanist, some experiments were made with a view of studying the effects of the ingestion of *Zygadenus elegans* on animals. Some cases of stock poisoning have occurred in the eastern portion of the state in which there was good reason to suspect this plant.

As only a small quantity of the plant could be obtained when the work could be done, no definite results were obtained. The intention, however, is to continue this line of work during the coming summer.

The experiments made thus far included feeding and hypodermic injection of substances obtained by the Stass-Otto alkaloid extraction method. Rabbits were used in those preliminary experiments. The following observations were made:

Rabbit No. 1. Five grams of the bulb were offered at 10 a. m. At 12 m. 0.5 grams was eaten. At 1.30 p m. the whole quantity was consumed, but with reluctance. The rabbit was watched until 6 p. m., but no toxic symptoms made their appearance.

Rabbit No. 2. Forty grams of dried plants were offered and consumed in two hours. No effect followed the eating of the plants.

Rabbit No. 3. Received hypodermatically 0.04 grams of substance extracted with chloroform, but did not suffer any bad effects.

Rabbit No. 4. Received subcutaneously 0.03 grams of substance obtained by ether extraction of alkaline extract of plant. Injection made at 3 p. m. At 3:30 slight inco-ordination of movements was noticed. At 3:45 the same is continued, and when the animal is excited by blowing upon it, it has a slight convulsion. At 4:30 the rabbit fell upon its back and is not able to resume the normal posture without aid. The intoxication is very marked. At 5:30 the rabbit it very stupid and its breathing shallow. The following morning the animal is apparently very sick, and at 2 p. m. it died. Weight of rabbit, 490 grams.

The lesions shown on post mortem are such that death by sepsis was not improbable. The symptoms of the preceding day were undoubtedly due to the injection of the toxic material.

Rabbit No. 5. Received hypodermatically 0.01 grams of substance obtained by chloroform extraction of acidulated extract of plants. Some transitory dullness resulted, but in three hours the rabbit was apparently all right.

Rabbit No. 6. Subcutaneous injection of 0.02 grams of material obtained by ether extraction of acidulated extract of plant. This

caused the animal to droop in the corner of its cage for a few hours, but produced no results otherwise.

Rabbit No. 7. Ten c. c. of watery extract were introduced into the stomach by means of a rubber tube. No toxic effects developed.

Rabbit No. 8. Fifteen c. c. were given in the same manner as in No. 7. No evidence of poisoning was observed.

Effort will be made to continue these experiments, not only on rabbits, but also on cattle and sheep, during the coming season. The wide distribution of this plant certainly is warrant for endeavoring to gain some definite knowledge on this subject.

While the extent of the live stock industry of the state seems to warrant the undertaking of research work on animal disease, this Department has not been able to do much in this direction, owing to lack of proper equipment. Our laboratory facilities are very limited, only one small room being set aside for this purpose, and as this space was not designed for use as a laboratory, considerable annoyance and inconvenience is experienced.

The laboratory is only provided with the most essential apparatus, and of this a large part is private property. For the necessary laboratory animals a small closed shed is used, and when during inoculation experiments animals are to be kept under constant observation, the cages have to be taken in the laboratory room, where they are certainly not conducive to a healthy atmosphere or to the cleanliness so essential in places where virulent bacteria are being handled.

The lack of a special stable and post mortem room for farm animals is greatly felt. If such a place were available, diseased animals could be kept under continued observation for clinical study, or autopsies could be held close to the laboratory, which is an almost imperative feature when carrying on research work.

Such work is at present out of the question, as it would be hazardous to bring diseased animals to the station stables where valuable animals are being kept for other purposes.

Among the investigations which seem to merit attention there may be mentioned a study on the live history of the scab mite and its resistance to the various acaricides now in use, along with experiments in improving the present methods of scab eradication. For such work it would be necessary to keep scabby animals the year around, and without special equipment this would be highly detrimental to our high bred farm animals.

Tape worm disease in sheep also deserves our most earnest attention. Losses are continually sustained through the infestment by *Taenia fimbriata*, and while some general rules for prevention may be formulated, intelligent eradication is not possible as long as the life history of this parasite is not understood. It seems that the interests of our wool and mutton growers are of such a proportion as to warrant the beginning of some investigation in this direction.

A peculiar anaemia of the horse known as swamp fever offers a field for investigation, and deserves attention from a practical as well as a purely scientific standpoint.

Besides those investigations, immunization experiments may be conducted in relation to hemorrhagic septicaemia, tuberculosis, glanders and other communicable diseases occurring in North Dakota.

The Department library has been neglected for years, and is poor in works of reference bearing on animal disease, general pathology, bacteriology and laboratory technique. There are absolutely no files of the current literature on these subjects, but the writer is glad to state that during the past year some very important periodicals have been added to the library.

Permit me to close with the recommendation that the Veterinary Department be provided with the necessary building and equipments in order to carry on experiments and research work on animal diseases to an extent commensurate with the ever increasing live stock interests of the state.

Respectfully submitted,

L. VAN ES,
Veterinarian.

REPORT OF THE FOOD COMMISSIONER.

To J. H. Worst, Director:

SIR: I herewith submit my First Annual Report as Food Commissioner for North Dakota, covering the period of six months since my appointment at the time the law went into effect, July 1, 1903.

The eighth session of the legislative assembly enacted a pure food law, and charged the Experiment Station with the enforcement of the law, and designated the chemist of the North Dakota Government Agricultural Experiment Station as the official chemist for analyzing foods and beverages offered for sale in the state. The board of trustees of the Experiment Station, at the regular monthly meeting, April 8, 1903, passed the following resolutions:

"WHEREAS, The eighth legislative assembly of North Dakota having passed senate bill No. 26, providing for the inspection and analysis of foods, and making it the duty of the North Dakota Government Agricultural Experiment Station to inspect and analyze such foods; therefore be it

Resolved, That the board appoint the chemist of the Experiment Station, Professor E. F. Ladd, as food commissioner to have charge of the work, and that he be authorized and empowered to execute the requirements imposed upon the Experiment Station by said act, the expenditure therefor being limited to the amount appropriated by the state for such purpose."

With an annual appropriation of only $1,500, it was necessary that the work be done systematically or but little could possibly be accomplished with the available funds.

A study of the law as enacted convinced me that three guiding principles are laid down in the law, namely:

1st. Harmful chemical preservatives are not to be used in food products or beverages.

2d. Harmful coloring matters, or coloring matters which would deceive or tend to deceive the purchaser with regard to the character of the goods, are considered as adulterants and their use prohibited.

3d. All food products and beverages shall be labeled true to name, and the substitution of cheaper or inferior products is considered as adulterants.

Under this interpretation of the law our duty seemed fairly clear, and to successfully enforce the law I have felt that the prosecution of the retail merchants, who are not always in a position to tell when food products are adulterated, would not be found the most satisfactory way of correcting the existing evil. The source of supply

needs first of all to be purified, and then there remains but little to do but to guard the consumer and see that the standard of purity is maintained, and to look after the few manufacturers who by nature are not honest, or the local retailers, few in number though they be, who are willing to sacrifice the health of their customers for the few extra dollars to be secured in handling inferior and adulterated products.

Proceeding on this line, we placed the matter before the wholesalers and manufacturers, informing them of our interpretation of the law, and telling them what we expected in the way of improvements in the food products to be offered for sale in this state.

We pointed out the fact that North Dakota had in the past been a "dumping ground" for adulterated goods and beverages; that the new law was stringent, and that the amount of publicity to be given the manufacturers of adulterated goods would react most disastrously for those who failed to comply with its requirements. I am pleased to say that, with three or four notable exceptions, all of the large foreign houses doing business in the state at once manifested a desire to have their goods in shape to meet the approval of the department. I feel that in this way we have accomplished more in the first six months for improving the purity of foods than could possibly have been accomplished in two years' time by any indiscriminate prosecution of retailers found violating the law, and this at much less expense to the state and without serious disturbance to business.

I count not the success by the number of prosecutions and convictions secured, but rather by the number of products turned back from the state, and the showing of purity for the goods now found in the state. Much still remains to be done, and many well known lines of foods are still found to be adulterated, but I have preferred to concentrate the work upon a few of the most important lines and then gradually extend this to include others during the coming year.

NOTICEABLE CHANGES

The cheap jellies, jams, preserves, etc., made from waste apple products are no longer labeled and sold as currant, strawberry, etc., but are clearly labeled and sold as "Fruit Jelly," etc., and no longer contain preservatives and coal tar dyes. One year ago our report showed that 100 per cent of the jellies, jams and preserves were, under our law, adulterated; today we find but a small per cent in violation of the law.

Where sulphites were used in nearly all grades of corn and succotash, we find only rarely the product offered for sale in the state. Saccharin was found in the majority of canned corns, beans, peas and fruits, but at the present time is not generally employed, and the few who continue its use are generally labeling the goods to show its presence. Benzoic acid and salicylic acid are still too frequently employed in preserved goods.

EXTRACTS AND FLAVORS.

One year ago, so far as I have been able to find out, there were but two brands of extracts sold in North Dakota always what they were represented to be. The great majority of extracts of lemon and vanilla were artificial products of little value, not infrequently colored with coal tar dye and with little of merit to recommend them. Today these have been largely driven from the state or are so labeled that the public know what they contain. Some of the best lemon extracts are now sold without color, being water white, and the consumer should bear in mind that color is no indication that a product is to be preferred, for often color is used to cover up a fault.

VINEGARS.

One year ago a pure cider vinegar could hardly be found in the state. While there are sold spirit vinegars today, they must be so labeled, and the number of pure cider vinegars have largely increased. That a different line of goods was sold in this state from that offered in Minnesota is clearly shown in the case of vinegars. There are firms whose vinegars have been repeatedly tested in Minnesota, and the published records show them to have been cider vinegars, and yet in this state nothing but spirit vinegars were sold by the same firm, although the label distinctly guarantees the vinegar to be pure apple cider vinegar. Competition they claimed forced them to substitute the cheaper product for the genuine. The prices at which they were being sold do not always warrant this absurd assumption.

CANNED GOODS.

Sulphites were common in corn, as also was saccharin. The corn was largely bleached by means of sulphites, and the inferior product sweetened with saccharin or so-called coal tar sugar. The pack coming into the market at the present time is nearly free from sulphites, and saccharin, if used at all, is labeled to show its presence. After July 1, 1904, the use of saccharin is prohibited, and I am convinced this will be of advantage to the consumer. Soaked goods have not received the attention they deserve, but other duties of great moment have taken our time, and as soon as these matters are remedied we shall give further attention to these products.

Peas and string beans were also sweetened with saccharin, and in not a few instances chemical preservatives were employed. We have found formaldehyde and borax to be the most common preservative for these products. Saccharin has been found also in several samples of sweet pickles.

MAPLE SYRUPS AND SUGARS.

While several samples have been passed, I have yet to find, on the general market, one which I would class unhesitatingly as genu-

ine maple syrup or sugar. The majority of these products are more than 60 per cent of added cane sugar of the same density. In but few cases have we found these syrups to contain glucose, and in no instance have we found harmful ingredients. Under the North Dakota law, to label them as maple syrup when not made from the sap of the maple tree is misleading and deceiving the public, therefore, an adulteration. After July 1, 1904, these products must be labeled true to name in order to be legally sold in this state.

MEATS AND LARDS.

But little has been done as yet in the examination of meat and meat products. A few samples have been examined, and in two of these coal tar dye was found, also borax and sulphites. Several products used in preparing meat products have been examined and are far from being commendable. Quite a number of samples of canned meats have been analyzed, and in only two or three instances was borax found. Some samples of prepared boneless chicken and turkey used for sandwiches gave evidence of being largely composed of veal, bleached to resemble chicken. Some samples of chipped beef put up in glass contained borax used as a preservative agent. With lard very little has as yet been done in the way of systematic examination.

During the summer of 1904 it is proposed to give some attention to the meats sold in the state.

CANDIES AND CONFECTIONS.

The colored candies have been found to be very generally colored with coal tar dyes of various shades and classes. The most of these dyes have been found to be the so-called aniline or coal tar dyes. Some of the cheap candies have been found to be flavored with synthetic products in violation of the law. Some of the manufacturers of cheap candies have stated that if they had to comply with the law or the force of the same could not be broken they would withdraw from the state. This course would be to the health of the children.

BEVERAGES.

But few beverages have been examined thus far, and it has been found that many of these are wholly artificial products, colored with coal tar dyes, flavored with chemicals and preserved with salicylic acid or benzoic acid. It is believed that a great majority of the beverages—wines, brandies, ciders, cordials, etc.—are in violation of the law and will soon be driven from the market.

BOX CAR MERCHANTS.

During the past fall a large number of transient firms, so-called "box car merchants," flocked to the state at about harvest time

canvassing the country, taking orders for groceries, the goods to be delivered later. In my experience with the goods handled by this class of merchants hardly a product was pure or what it was represented to be. The cider vinegars proved to be cheap spirit vinegars colored. The extracts were illegal and inferior. The coffee purporting to be Mocha and Java contained no Mocha, and was mainly wild African Java, a very inferior product and but little better than chicory. The syrups were usually glucose, colored with coal tar dye and flavored artificially. Unless they bring a better grade of products, they will not be permitted another year to do business in the state.

PUBLICITY.

One commendable feature in the food law of the state is the required publicity in an official way. Nothing will drive wrongdoers to correct evils more quickly than publicity. Let the public know that this or that manufacturer's good are not pure but adulterated, and the discriminating public will refuse to purchase and the retailers no longer find it profitable to handle the products.

THE PRESS AND PUBLIC SENTIMENT.

The press of the state have unanimously supported the work of the department, and have done much to aid in creating a healthy public sentiment and keep the public informed of the character of the adulteration being practiced in food products sold in the state, and the aid given by the women's unions of federal clubs brought the matter directly before the people in the homes, thus forcing careless manufacturers to see that their goods would stand the test of purity.

PROSECUTIONS.

But few prosecutions have been necessary, and it is believed that the most of the work can be successfully accomplished without resorting to a large number of prosecutions. At all times a few court cases will be necessary, first, to keep a certain class of manufacturers, jobbers and retailers in line, and, second, to warn others of danger when they become careless.

Analyses of food products coming into the state and notices to the wholesalers have resulted in turning back whole car lots of goods coming into the state. Eastern manufacturers have visited the state and gathered up products formerly sold and removed them from the state. Other houses have requested merchants having certain lines of their goods to return them to be replaced with goods known to be in compliance with the law. Merchants have, to my personal knowledge, returned promptly to the jobbers goods found to be in noncompliance with the law.

SUBSTITUTIONS.

Syrups formerly labeled as sorghum are now labeled as glucose or as corn syrup or go under some coined name with the per cent of the several syrups making up the blend clearly indicated on the label. This is a commendable course and is as it should be. Glucose or corn syrup, properly made, free from acids, as it is at the present time, is a desirable food product, and should be sold for what it is and the public given to understand that the product is a natural food product. Sell it on its own merits and create a demand for it, and not have it masquerading under a false name and the public deceived. The same may be said of well prepared cotton seed oil as a salad oil, now generally sold falsely labeled as olive oil. Such a course is in direct violation of the law. Goods labeled as being put up in England, France, Germany, Italy or Spain are not uncommon, and in some cases it is known that they are put up in Chicago, New York or Philadelphia. Goods are so labeled for no other purpose than to deceive the consumer, and are, therefore, in violation of the law, and if they are to be sold in this state the labeling should be made to conform with the facts.

Jellies, jams, etc., made from the waste products of apples were formerly largely colored with coal tar dyes, flavored with artificial chemical flavor and then labeled and sold for strawberry, currant, raspberry, plum, etc. Such products are still on the market minus the coal tar dye, but are labeled and sold simply as "Fruit Jelly" or "Apple Jelly," and the public know what they are buying. There are still too many jellies sold as strawberry, currant and raspberry not composed wholly of these fruits, and we hope to see these largely corrected during the present year.

A few manufacturers, whose reputation for pure goods of high grade is not particularly enviable, have withdrawn from doing business in this state, much to my satisfaction and to the welfare and health of the rising generation. A few others will possibly do likewise, but in most cases the manufacturers are changing the goods or the labeling to comply with the law.

The amount of work has been far in excess of anything we had anticipated. The large influx of box car merchants had not been anticipated. Largely driven from Minnesota, when their goods would not stand the test of the pure food law, they came to North Dakota and did a large business. For the coming year a large amount of field work will be necessary to hold this class of goods in check, and to prevent the people from being imposed upon. We had not anticipated such strenuous or general opposition from manufacturers of adulterated goods, including those who supply the public with chemical preservatives, coal tar dye and saccharin. These parties have flooded the state with literature derogatory of the work being done for the protection of the public. That the chemical preservatives are unnecessary and may often prove injurious to health has

been repeatedly pointed out by others, and I have presented some of the reasons against their use in Bulletins Nos. 53 and 57. In Bulletin No. 53 we discussed the use of coal tar dye in food products. Even though not all of these dyes are harmful, is there any gain to the public in permitting these products to be employed in foods? Does it not permit of the grossest kind of practice when there is any desire to cover up fraud? It cannot be said that these dyes add anything to the food value. Neither can it be said, used as they have been, that they have always added to the attractiveness of food products.

SOME COMPARISONS.

In the Thirteenth Annual Report of the Experiment Station, page 32, we gave a tabulated statement showing the extent of food adulteration as shown by our analyses. From this table we reproduce the following.

TABLE SHOWING FOOD PRODUCTS EXAMINED IN 1902.

	No. Examined	No. Pure	No. Adulterated	Per Cent Adulterated
Jellies, preserves, etc.	33	0	33	100
Catsups, bottled	8	0	8	100
Canned corn and succotash	9	1	8	88
Canned peas	12	6	6	50
Canned tomatoes	10	6	4	40
Lemon extracts	10	3	7	70
Vanilla extracts	10	3	7	70
Candies	28	14	14	50
Totals and average	120	33	87	72

Comment regarding the above table is unnecessary.

We now reproduce from our records the results of aur analyses for the three months, October, November and December, 1903. In this we have assumed that the samples of canned goods, etc., are from the pack of 1903, but in some instances it is known that old stock was examined.

TABLE SHOWING ANALYSES FOR FOOD PRODUCTS—FALL OF 1903.

	No. Examined	No. Pure	No. Adulterated	Per Cent Adulterated
Jellies, preserves, etc.	96	67	29	30
Catsups, bottled	36	27	9	25
Canned corn and succotash	39	28	11	28
Canned peas	24	15	9	38
Canned tomatoes	24	24	0	0
Lemon extracts	21	11	10	47
Vanilla extracts	10	5	5	50
Candies	42	28	14	33
Totals and average	268	215	87	32

The total number of samples has been much larger than in 1902, but the per cent of adulterated goods has been reduced from 72 to 32 per cent. The most marked change has been found in preserves, jams, jellies, etc. Where one year ago every sample examined was adulterated, now but 30 per cent are found to be illegal. We may add also that the quality has been proportionately improved.

We feel justified in saying that the people of North Dakota are today receiving a class of food products from the groceries which will compare favorably with those sold in our sister states.

Much yet remains to be done, but we feel encouraged at the substantial progress made during the first six months under the new law.

I submit herewith the report of the chemical work completed during the past year.

Respectfully submitted,

E. F. LADD.

CHEMICAL WORK DONE IN 1903.

PRESERVES, JAMS, JELLIES, ETC.—LEGAL.

Lab. No. 68.
Brand, Cal. Yellow Crawford Peaches, University.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Retailer, Berg. Bros., Cooperstown.

Lab. No. 82.
Brand, Pure Blackberry Jam, Dinner Party.
Producer or jobber, Orchard Park Canning Co., Orchard Park, New York.
Retailer, Nash Bros., Grand Forks.

Lab. No. 113.
Brand, Strawberry Jam, Our Favorite.
Producer or jobber, Farnham Canning Co., Erie, N. Y.
Retailer, Mr. Grant, Fargo.

Lab. No 117. (Passed.)
Brand, Raspberry Preserves, Griffin's Extra.
Producer or jobber, California Fruit Canners' Association.
Retailer, Mr. Grant, Fargo.

Lab. No. 139. (Passed.)
Brand, Strawberry Preserves, Purity.
Producer or jobber, E. G. Daily & Co., Detroit, Mich.
Retailer, Anthony Kelly & Co. Minneapolis

Lab. No. 217.
Brand, Strawberry Preserves, Purity.
Producer or jobber, E. G. Daily & Co., Detroit, Mich.
Retailer, Anthony Kelly & Co. Minneapolis

Lab. No. 243.
Brand, Strawberry Preserves, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 244.
Brand, Red Currant Jelly, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 252.
Brand, Strawberries, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 253.
Brand, Blackberries, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 254.
Brand, Red Cherries, Jack Rose.
Producer or jobber, Fleming & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 255.
Brand, Grated Pineapple, Gold Seal.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 256. (Passed.)
Brand, Raspberries, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 259.
Brand, Strawberries, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 262.
Brand, Grated Pineapple, Florida.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 263.
Brand, Choice Rhubarb, Aurora.
Producer or jobber, Geneva Preserving Co., Geneva, N. Y.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 264. (Passed.)
Brand, Pie Peaches, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 266.
Brand, Bartlett Pears, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 267. (Passed.)
Brand, Red Pitted Cherries, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 270.
Brand, Sliced Peaches for Cream, Bengal.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 271.
Brand, Bartlett Pears, Vertibull.
Producer or jobber, H. F. Hemingway & Co., Baltimore, Md.
Lab. No. 273. (Passed.)
Brand, Fresh Peaches, First Quality.
Producer or jobber, P. Wheeler & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 274. (Passed.)
Brand, Apricots, Amazon.
Producer or jobber, Haywards Canning Co., Haywards, Cal.
Lab. No. 275.
Brand, Crawford Peaches, Hesperian.
Producer or jobber, Hunt Bros. Co., Haywards, Cal.
Lab. No. 282.
Brand, Gooseberries, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 286.
Brand, White Cherries, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 288.
Brand, Red Raspberries, preserves, America.
Producer or jobber, Kidwell Bros. & Co., Baltimore, Md.
Lab. No. 290.
Brand, Gooseberries, Bengal.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 295.
Brand, Blueberries, Eagle.
Producer or jobber, A. & R. Loggie, Loggieville, N. B., Canada
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 296.
Brand, Preserved Strawberries, Bengal.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 300. (Passed.)
Brand, Strawberries, Canned.
Producer or jobber, Geo. R. Newell, Minneapolis.

Lab. No. 304.
Brand, Blueberries, Eagle.
Producer or jobber, A. & R. Loggie, Loggieville, N. B., Canada.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 313. (Passed.)
Brand, White Cherries, Ox Heart, Honey Dew.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.

Lab. No. 317.
Brand, Red Raspberries, Honey Dew.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.

Lab. No. 318. (Passed.)
Brand, Red Raspberry Jam, Honey Dew.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.

Lab. No. 319. (Passed.)
Brand, Pure Strawberry Jam, Honey Dew.
Producer or jobber, Erie Preserving Co., Fenton, N. Y.

Lab. No. 320. (Passed?)
Brand, Black Raspberry Jam, Honey Dew.
Producer or jobber, Erie Preserving Co.

Lab. No. 326.
Brand, Raspberry, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Foley Bros. & Kelly, St. Paul.

Lab. No. 327.
Brand, Blueberries, Eagle.
Producer or jobber, A. & R. Loggie, Loggieville, N. B., Canada.
Retailer, Foley Bros. & Kelly, St. Paul.

Lab. No. 335.
Brand, Extra Strawberries, Flour City.
Producer or jobber, Curtice Bros., Rochester, N. Y.
Retailer, Foley Bros. & Kelly, St. Paul.

Lab. No. 338. (Passed.)
Brand, Gooseberries, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Foley Bros. & Kelly, St. Paul.

Lab. No. 340.
Brand, Blackberries, Extra Standard.
Producer or jobber, Gibb's Preserving Co., Baltimore, Md.
Retailer, Foley Bros. & Kelly, St. Paul.
Lab. No. 343. (Passed.)
Brand, Gooseberries, Ribbon.
Producer or jobber, Geneva, N. Y., company not given.
Lab. No. 345.
Brand, Strawberries, Challenge.
Producer or jobber, H. S. Langfair & Co., Baltimore, Md.
Lab. No. 350.
Brand, Preserved Red Raspberries, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Foley Bros. & Kelly, St. Paul.
Lab. No. 353.
Brand, Sliced Pineapple, No. 5.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 354.
Brand, Grated Pineapple, No. 6.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 362.
Brand, Black Raspberries, No. 2.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 363.
Brand, Preserved Blackberries, No. 3.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 364.
Brand, Strawberries, No. 1.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 367.
Brand, Gooseberries, Preserved, No. 4.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 381. (Passed.)
Brand, Blackberries, Victory.
Producer or jobber, John Boyle Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 382.
Brand, Strawberries, Victory.
Producer or jobber, John Boyle Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 383.
Brand, Grated Pineapple, Florida.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.
Lab. No. 384.
Brand, Sliced Pineapple, Florida.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 385.
Brand, Extra Pineapple, Oval.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 386.
Brand, Grated Pineapple, Gold Seal.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 387.
Brand, Blueberries, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 476.
Brand, Preserved Strawberries, University.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Retailer, M. Grange, Sheldon.

Lab. No. 490.
Brand, Preserved Pitted Cherries, Millionaire's Club.
Producer or jobber, Fenton Bros. Co., Fenton, N. Y.
Retailer, H. V. Hicks & Son, Oakes.

Lab. No. 491.
Brand, Red Raspberries, Gertfield.
Producer or jobber, North Collins Preserving Co. North Collins, New York.
Retailer, H. V. Hicks & Son, Oakes.

Lab. No. 500.
Brand, Strawberries, Jewett's High Grade.
Producer or jobber, Jewett Bros, Aberdeen, S. D.
Retailer, Cunningham & Lawrence, LaMoure.

Lab. No. 510.
Brand, Preserved Strawberries, University.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Retailer, Hurley Bros., Forman.

Lab. No. 554. (Questionable.)
Brand, Pure Strawberry Jelly, Belmont.
Producer or jobber, Chicago Concentrating Co., Chicago, Ill.
Retailer, Wright-Clarkson Mercantile Co., Duluth, Minn.

Lab. No. 581.
Brand, Strawberry Table Preserves.
Producer or jobber, Curtice Bros.' Co., Rochester, N. Y.
Retailer, M. W. Hansen & Co., Grand Forks.

Lab. No. 612.
Brand, Strawberries, Boyer's.
Producer or jobber, W. W. Boyer & Co., Baltimore, Md.
Retailer, J. O. Hansen, Churchs Ferry.

Lab. No. 616.
Brand, Cherry Preserves, Heinz's.
Producer or jobber, H. J. Heinz Co., Pittsburg, Pa.
Retailer, C. T. Studness, Churchs Ferry.

Lab. No. 655.
Brand, Fort Snelling Strawberries.
Jobber, Foley Bros, & Kelly, St. Paul.
Retailer, L. LaMoure & Co., Neche, N. D.

Lab. No. 755.
Brand, Navy Black Raspberries.
Producer or jobber, Coob Preserving Co. Fairport, N. Y.
Jobber, Foley Bros. & Kelly, St. Paul.

Lab. No. 760.
Brand, Peerless Strawberries.
Producer, C. H. Pearson Packing Co., Baltimore, Md.
Retailer, Fargo Mercantile Co., Fargo.

Lab. No. 762.
Brand, Peerless Raspberries, Preserved Red.
Producer, C. H. Pearson Packing Co., Baltimore, Md.
Retailer, Fargo Mercantile Co., Fargo.

Lab. No. 763.
Brand, Peerless Blueberries.
Producer, C. H. Pearson Packing Co., Baltimore, Md.
Retailer, Fargo Mercantile Co., Fargo.

Lab. No. 791.
Brand, Monogram Black Raspberries.
Producer or jobber, Winston, Harper & Fisher, Minneapolis.

Lab. No. 835.
Brand, West Shore Black Raspberries.
Producer, Newark, N. J.

Lab. No. 836.
Brand, University Preserved Strawberries.
Producer or jobber, Winston, Harper & Fisher, Minneapolis.

Lab. No. 844.
Brand, Jack Rose Strawberries.
Producer, Fleming & Co., Baltimore, Md.
Jobber, Park, Grant & Morris, Fargo.

Lab. No. 847.
Brand, America Red Raspberries.
Producer, Kidwell Bros. & Co., Baltimore, Md.
Jobber, Park, Grant & Morris, Fargo.

Lab. No. 848.
Brand, America Strawberries.
Producer, Kidwell Bros. & Co., Baltimore, Md.
Jobber, Park, Grant & Morris, Fargo.

Lab. No. 849.
Brand, America Blueberries.
Producer, Kidwell Bros. & Co., Baltimore, Md.
Jobber, Park, Grant & Morris, Fargo.
Lab. No. 864.
Brand, Extra Black Raspberries.
Producer, Geneva Preserving Co., Geneva, N. Y.
Lab. No. 865.
Brand, Extra Blackberries.
Producer, Geneva Preserving Co., Geneva, N. Y.
Lab. No. 866.
Brand, Preserved Red Raspberries.
Producer, Geneva Preserving Co., Geneva, N. Y.
Lab. No. 906.
Brand, University Preserved Black Raspberries.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Lab. No. 907.
Brand, University Blackberries.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Lab. No. 908.
Brand, Monogram, Red Raspberries.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Lab. No. 909.
Brand, University Red Raspberries.
Producer, Winston, Harper, Fisher & Co., Minneapolis.
Lab. No. 918.
Brand, Spring Apricots.
Producer, Bay Counties Preserving Co., San Francisco, Cal.
Retailer, Park, Grant & Morris, Fargo.
Lab. No. 919.
Brand, Spring Lemon Cling Peaches.
Producer, Bay Counties Preserving Co. San Francisco, Cal.
Jobber, Park, Grant & Morris, Fargo.
Lab. No. 920.
Brand, Spring Bartlett Pears.
Producer, Bay Counties Preserving Co., San Francisco, Cal.
Jobber, Park, Grant & Morris, Fargo.
Lab. No. 937.
Brand, Shield Strawberries.
Producer, J. S. Farren & Co., Baltimore, Md.
Lab. No. 950.
Brand, Monogram Black Raspberries.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Retailer, S. C. Tooker & Co., Minneapolis.

Lab. No. 951.
Brand, Monogram Blackberries.
Producer, Winston, Harper, Fisher & Co., Minneapolis.
Retailer, S. C. Tooker & Co., Minneapolis.
Lab. No. 952.
Brand, Monogram Red Raspberries.
Producer, Winston, Harper, Fisher & Co., Minneapolis.
Retailer, S. C. Tooker & Co., Minneapolis.
Lab. No. 1001.
Brand, Monarch Red Raspberries.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, A. Haas, Jamestown.
Lab. No. 1034.
Brand, Pure Fruit Jam, Plum.
Producer or jobber, Reid, Murdock & Co., Chicago.
Lab. No. 1035.
Brand, Batavia Red Pitted Cherries.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1036.
Brand, Yellow Crawford Peaches.
Producer, J. H. Flickinger Co., San Jose, Cal.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1054.
Brand, Baldwin Apples.
Producer, Erie Preserving Co., Buffalo, N. Y.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1055.
Brand, Amazon White Cherries.
Producer, Haywards Canning Co., Haywards, Cal.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1056.
Brand, Bartlett Pears.
Producer, J. H. Flickinger Co., San Jose, Cal.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1060.
Brand, Monarch Apricots.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1062.
Brand, Monarch Extra Red Raspberries.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1063.
Brand, Batavia Crab Apples.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1070.
Brand, Our Choice Bartlett Pears.
Producer, King Morse Canning Co., San Francisco, Cal.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1076.
Brand, Monarch Pineapple.
Producer, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1078.
Brand, Yellow Peaches.
Producer, John Hunt & Co., Baltimore, Md.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1089.
Brand, Royal American Batavia White Cherries.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1091.
Brand, Batavia Red Cherry Preserves.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1092.
Brand Orange Marmalade.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1094.
Brand, Batavia Red Currant Jam.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1096.
Brand, Batavia Red Currant Jelly.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1097.
Brand, Bishop California Orange Jelly.
Producer, Bishop & Co., Los Angeles, Cal.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1113.
Brand, Blue Label Red Currant Jelly.
Producer, Curtice Brothers & Co., Rochester, N. Y.
Retailer, McKean & Probert, Wahpeton.

Lab. No. 1212.
Brand, Monarch Red Strawberries.
Producer, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1240.
Brand, Banquet Yellow Free Peaches.
Producer, Southern California Packing Co., Los Angeles, Cal.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1241.
Brand, Muscat Grapes, Banquet Brand.
Producer, Southern California Packing Co., Los Angeles, Cal.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1246.
Brand, Monarch Red Cherries.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1249.
Brand, Palm Royal Apricots.
Producer, Royal California Packing Co., Los Angeles, Cal.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1250.
Brand, Peaches, Yellow Crawford.
Producer, Hercules Packing Co., San Francisco, Cal.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1251.
Brand, California Fruit, Bartlett Pears.
Producer, Hercules Packing Co., San Francisco, Cal.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1252.
Brand, Dragon Strawberry Preserves.
Producers or jobbers, The Williams Bros. Co., Detroit, Mich.
Retailers, Fargo Grocery Co., Fargo, N. D.

Lab. No. 1259.
Brand, Monarch Sliced Pineapple.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1310.
Brand, Challenge Strawberries.
Producer, H. S. Lanfais & Co., Baltimore, Md.
Jobber, Foley Brothers & Kelly, St. Paul.

JAMS, JELLIES, PRESERVES, ETC.—ILLEGAL.

Lab. No. 79.
Brand, Monogram Preserved Strawberries.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Color, coal tar dye.

Lab. No. 80.
Brand, University Preserved Strawberries.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Preservative, saccharin; color, coal tar dye.

Lab. No. 137
Brand, Farren's Shield Strawberries.
Producer or jobber, J. S. Farren & Co., Baltimore, Md.
Retailer, Winston, Harper, Fisher & Co. Minneapolis.
Preservative, saccharin.

Lab. No. 199.
Brand, Strawberries, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Preservative, benzoic acid or benzoate of soda.

Lab. No. 200.
Brand, Bengal Preserved Strawberries.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Preservative, benzoic acid; color, added color.

Lab. No. 241.
Brand, Bengal Preserved Strawberries.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Is not strawberry and contains starch paste.

Lab. No. 242.
Brand, Victor Strawberry Preserves.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Not pure strawberry fruit.

Lab. No. 312.
Brand, Honey Dew Red Cherry Preserves.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.
Color, coal tar dye.

Lab. No. 314.
Brand, Honey Dew Preserved Strawberries.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.
Color, coal tar dye.

Lab. No. 372.
Brand, Newell's Extra Strawberries.
Producer or jobber, Geo. R. Newell, Minneapolis.
Preservative, salicylic acid.

Lab. No. 436.
Brand, Canned Strawberries.
Producer or jobber, Geo. R. Newell, Minneapolis.
Color, coal tar dye.

Lab. No. 456.
Brand, U. S. Preserved Strawberries.
Producer or jobber, U. S. Canning Co., Fredonia, N. Y.
Retailer, Joseph Goodman, Sheldon.
Preservative, salicylic acid.

Lab. No 482.
Brand, Honey Dew Red Raspberry Jam.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.
Retailer, Ramharter Bros., Oakes.
Color, coal tar dye.

Lab. No. 555.
Brand, Golf Club Raspberry Preserves.
Producer or jobber, Chicago Concentrating Co., Chicago, Ill.
Retailer, Wright, Clarkson Mercantile Co., Duluth, Minn.
Preservative, benzoic acid; color, cochineal.

Lab. No. 556.
Brand, Belmont Raspberries.
Producer or jobber, Chicago Concentrating Co., Chicago, Ill.
Retailer, Wright, Clarkson Mercantile Co., Duluth, Minn.
Preservative, benzoic acid; color, coal tar dye.

Lab. No. 573.
Brand, California Fruit Preserves.
Producer, unknown.
Sent in by W. B. Douglas, Fargo.
Preservative, salicylic acid.

Lab. No. 574.
Brand, Miss Williams' Pure Home Made Raspberry Jelly.
Producer, made in Des Moines, Ia.
Retailer, W. F. Perry, Grand Forks.
Preservative, salicylic acid.

Lab. No. 582.
Brand, Fresh Fruit Extra Quality of Strawberry Jam.
Producer or jobber, Curtice Brothers, Rochester, N. Y.
Retailer, M. W. Hansen & Co., Grand Forks, N. D.
Preservative, benzioc acid.

Lab. No. 603.
Brand, Strawberries.
Producer or jobber, Foley Brothers & Kelly, St. Paul.
Contains coal tar dye.

Lab. No. 615.
Brand, Pure Food Preserved Strawberries.
Producer or jobber, Pure Food Preserving Co., Buffalo, N. Y.
Retailer, C. T. Studness, Churchs Ferry, N. D.
Contains coal tar dye.

Lab. No. 626.
Brand, Home Red Raspberries.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Retailer, P. A. Jorgenson, Grafton, N. D.

Lab. No. 633.
Brand, Heinz' Currant Jelly.
Producer or jobber, H. J. Heinz & Co., Pittsburg, Pa.
Retailer, H. G. Sprague, Grafton, N. D.
Preservative, sulphites and benzoic acid.

Lab. No. 653.
Brand, Red Currant Jelly.
Producer or jobber, E. S. Cowdry Co., Boston, Mass.
Retailer, W. Crawford & Son, Neche.
Contains coal tar dye.

Lab. No. 700.
Brand, Brighton Strawberry Jam.
Producer or jobber, Curtice Brothers Co., Rochester, N. Y.
Retailer, Devils Lake Co-operative Association.
Preservative, sulphites.

Lab. No. 701.
Brand, Monroe Strawberries.
Producer or jobber, Rochester Preserving Co., Rochester, N. Y.
Retailer, Devils Lake Co-operative Association.
Preservative, formaldehyde.

Lab. No. 712.
Brand, Eagle Grape Jam.
Producer or jobber, Anderson Preserving Co., Camden, N. Y.
Retailer, P. de Fiore, Devils Lake, N. D.
Preservative, sulphites and coal tar dye.

Lab. No. 730.
Brand, Pure Fruit Strawberry Jam.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, A. D. Sprague, Devils Lake, N. D.
Preservative, coal tar dye.

Lab. No. 738.
Brand, Peerless Strawberries.
Producer or jobber, C. H. Pearson Packing Co., Baltimore, Md.
Retailer, F. W. Manns & Son, Devils Lake, N. D.

Lab. No. 741.
Brand, Strawberry Preserves.
Producer or jobber, Curtice Brothers Canning Co., Rochester, N. Y.
Retailer, F. W. Manns & Son., Devils Lake, N. D.
Preservative, sulphites.

Lab. No. 761.
Brand, Peerless Red Cherries.
Producer or jobber, C. H. Pearson Packing Co., Baltimore, Md.
Retailer, Fargo, Mercantile Co., Fargo.
Preservative, borax.

Lab. No. 790.
Brand, Monogram Red Raspberries.
Producer, Winston, Harper, Fisher & Co., Minneapolis.
Preservative, sulphites.

Lab. No. 792.
Brand, Monogram Blackberries.
Producer, Winston, Harper, Fisher & Co., Minneapolis.
Preservative, formaldehyde.

Lab. No. 801.
Brand, Strawberries.
Producer or jobber, Nash Brothers, Grand Forks.
Preservative, coal tar dye.

Lab. No. 802.
Brand, Strawberries.
Producer or jobber, Nash Brothers, Grand Forks.
Preservative, coal tar dye.

Lab. No. 878.
Brand, Clover Leaf Strawberry Jelly.
Producer or jobber, Chicago Concentrating Co., Chicago.
Retailer, box car merchant.
Preservative, borax, sulphites and coal tar dye.

Lab. No. 889.
Brand, Pride of the West Preserved Pure Apple Butter.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Preservative, coal tar dye and salicylic acid.

Lab. No. 937.
Brand, Shield Strawberries.
Producer, J. S. Farren & Co., Baltimore, Md.
Retailer, box car merchant.
Preservative, saccharin.

Lab. No. 956.
Brand, Cerises au Marasquin Cherries.
Producer or jobber, Geo. Dalidet & Co., Bordeaux, France.
Retailer, L. Stern, Larimore, N. D.
Preservative, coal tar dye and salicylic acid.

Lab. No. 957.
Brand, Palace Car Preserved Strawberries.
Producer or jobber, Buffalo Preserving Co., Buffalo, N. Y.
Retailer, L. A. Brookes, Larimore.
Preservative, coal tar dye and formaldehyde.

Lab. No. 972.
Brand, Dinner Party Strawberries.
Producer, Orchard Park Canning Co., Erie, N. Y.
Retailer, R. B. Griffith, Grand Forks.
Preservative, coal tar dye.

Lab. No. 976.
Brand, Dinner Party Pitted Red Cherries.
Producer, Orchard Park Canning Co., Erie, N. Y.
Retailer, Colton Bros., Grand Forks.
Preservative, coal tar dye.

Lab. No. 978.
Brand, Cerises au Marasquin.
Producer, Geo. Dalidet & Co., Bordeaux, France.
Retailer, Geo. H. Wilder, Grand Forks.
Colored with coal tar dye.

Lab. No. 980.
Brand, Club House Cherries.
Producer or jobber, Franklin McVeagh & Co., Chicago.
Retailer, John E. Johnson, Grand Forks.
Preservatives, benzoic acid, borax and coal tar dye.

Lab. No. 983.
Brand, Dinner Party Strawberry Jam.
Producer, Erie Preserving Co., Buffalo, N. Y.
Retailer, K. M. Nass & Co., Grand Forks.
Not pure strawberry and improperly labeled.

Lab. No. 984.
Brand, Red Pitted Cherries.
Producer, Curtice Brothers, Rochester, N. Y.
Retailer, K. M. Nass & Co., Grand Forks.
Preservative, borax and coal tar dye.

Lab. No. 1002.
Brand, Victory Preserved Red Raspberries.
Producer, John Boyle Co., Baltimore, Md.
Retailer, A. Haas, Jamestown.
Preservative, saccharin.

Lab. No. 1009.
Brand, Pride of Rome Preserved Red Raspberries.
Producer, Olney Brothers, Rome, N. Y.
Retailer, G. E. Lyman, Jamestown.
Preservative, benzoic acid.

Lab. No. 1024.
Brand, Crown Princess Strawberry Jam.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.
Retailer, Park, Grant & Morris, Fargo.
Preservative, coal tar dye.

Lab. No. 1033.
Brand, Preserved Cherries.
Producer or jobber, Bishop & Co., Los Angeles, Cal.
Retailer, T. E. Yerxa, Fargo.
Contains coal tar dye.

Lab. No. 1048.
Brand, Eagle Strawberry Jam.
Producer or jobber, Anderson Preserving Co., Camden, N. Y.
Retailer, J. H. Hansen, Hillsboro.
Colored with coal tar dye.

Lab. No. 1074.
Brand, California Fruit Black Cherries.
Producer, Hercules Packing Co., San Francisco, Cal.
Retailer, T. E. Yerxa, Fargo.
Preservative, borax.

Lab. No. 1090.
Brand, Monarch Extra Preserved Strawberries.
Producer, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Colored with coal tar dye.

Lab. No. 1090.
Brand, Strawberries.
Producer or jobber, Bishop & Co., Los Angeles, Cal.
Retailer, T. E. Yerxa, Fargo.
Colored with coal tar dye.

Lab. No. 1104.
Brand, Bengal Strawberry Preserves.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Retailer, Brueger Mercantile Co., Williston, N. D.
Preservative, sulphites.

Lab. No. 1116.
Brand, Honey Dew Red Cherries.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.
Retailer, McKean & Probert, Wahpeton, N. D.
Colored with coal tar dye.

Lab. No. 1121.
Brand, Bigarreaux au Marasquin.
Producer or jobber, Geo. Dalidet & Co., Bordeaux, France.
Jobber, R. U. Delapenha & Co., New York.
Colored with coal tar dye.

Lab. No. 1152.
Brand, Certified Pitted Red Cherries.
Producer or jobber, North Collins Preserving Co., North Collins, N. Y.
Retailer, Leach, Gamble, Dexter & Co., Wahpeton.
Colored with coal tar dye.

Lab. No. 1189.
Brand, Peerless Strawberries.
Producer, C. H. Pearson Packing Co., Baltimore, Md.
Retailer, Farmers' Supply House, Fargo.
Preservative, salicylic acid.

Lab. No. 1280.
Brand, Monarch Strawberries.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.
Colored with coal tar dye and contains salicylic acid.

Lab. No. 1289.
Brand, Shield Blackberries.
Producer or jobber, J. S. Farren & Co., Baltimore, Md.
Retailer, Lewis Vidger Loomis, Fargo.
Sweetened with saccharin.

Lab. No. 1292.
Brand, Shield Strawberries.
Producer, J. S. Farren & Co., Baltimore, Md.
Retailer, Lewis Vidger Loomis, Fargo.
Preservative, salicylic acid.

Lab. No. 1312.
Brand, Shield Red Raspberries.
Producer or jobber, J. S. Farren & Co., Baltimore, Md.
Retailer, Lewis Vidger Loomis, Fargo.
Sweetened with saccharin.

CORN AND SUCCOTASH—LEGAL.

Lab. No. 292.
Brand, Lilac.
Producers, Kelly Canning Co., Waverly, Iowa.
Jobbers, Griggs, Cooper & Co., St. Paul.

Lab. No. 293.
Brand, Red Oak.
Producers, Camden Packing Co., Camden, N. Y.

Lab. No. 481.
Brand, Jewett's High Grade
Retailers, Jewett Brothers, Aberdeen, S. D.

Lab. No. 511.
Brand, Gilman's Early Crosby.
Producers, Gilman Canning Co., Gilman, Ia.
Retailer, Hurley Bros., Forman, N. D.

Lab. No. 578.
Brand, Pine Cone.
Producers, Valley Canning Co., Eau Caire, Wis.
Retailers, Salstad & Bookes, Grand Forks, N. D.

Lab. No. 579.
Brand, Lincoln.
Producers, Lowell Canning Co., Lowell, N. Y.
Retailer, Salstad & Bookes, Grand Forks, N. D.

Lab. No. 610.
Brand, Succotash, Lakeside.
Producers, Snowflake Canning Co., Brunswick, Me.
Retailers, S. S. Moen, Churchs Ferry.

Lab. No. 702,
Brand, Napoleon.
Producers, Waterloo Canning Co., Waterloo, Ia.
Retailers, Devils Lake Co-operative Association.

Lab No. 717.
Brand, Early Sweet.
Producers, Curtice Brothers, Rochester, N. Y.
Retailers, P. de Fiore, Devils Lake.

Lab. No. 740.
Brand, Bengal.
Producers, Griggs, Cooper & Co., St. Paul.
Retailer, F. W. Manns & Son, Devils Lake, N. D.

Lab. No. 742.
Brand, Empress.
Producers, Baxter Brothers, Brunswick, Me.
Retailers, Monsen Brothers & Co., Brocket, N. D.

Lab. No. 799.
Brand, Winnebago.
Producers, Lake Mills Canning Co., Lake Mills, Ia.
Retailers, Nash Brothers, Grand Forks.

Lab. No. 808
Brand, University.
Producers, Winston, Harper, Fisher & Co., Minneapolis.

Lab. No. 822.
Brand, Lake Mills.
Producers, Lake Mills Canning Co., Lake Mills, Ia.

Lab. No. 953.
Brand, Vinton.
Producers, Iowa Canning Co., Vinton, Ia.
Retailers, Park, Grant & Morris, Fargo.

Lab. No. 973.
Brand, Pure Food.
Producers, Pure Food Preserving Co., Buffalo, N. Y.
Retailers, R. B. Griffith, Grand Forks.

Lab. No. 982.
Brand, Blackhawk.
Producers, Waterloo Canning Co., Waterloo, Ia.
Retailers, K. M. Nass & Co., Grand Forks.

Lab. No. 1006.
Brand, Pride of Rome.
Producers, Olney Brothers, Rome, N. Y.
Retailers, Wm. O'Hara, Bismarck.

Lab. No. 1012.
Brand, Carol.
Producers, Geo. R. Newell, Minneapolis.
Retailers, Churchill Webster Co., Jamestown.

Lab. No. 1042.
Brand, Garrison County Club.
Producers, Iowa Canning Co., Garrison, Ia.
Retailers, Fargo Mercantile Co., Fargo, N. D.

Lab. No. 1071.
Brand, Succotash, Batavia.
Producers, Batavia Preserving Co., Batavia, N. Y.
Retailers, T. E. Yerxa, Fargo.

Lab. No. 1100.
Brand, Wisconsin Maiden.
Producers, Dodgeville Canning & Mfg. Co., Dodgeville, Wis
Retailers, T. E. Yerxa, Fargo.
Lab. No. 1101.
Brand, Pride of Cannon Valley.
Producers, Faribault Canning Co., Faribault, Minn.
Retailers, T. E. Yerxa, Fargo.
Lab. No. 1107.
Brand, Gopher.
Producers, Foley Brothers & Kelly, St. Paul.
Retailers, Hedderich Brothers & Co., Williston, N. D.
Lab. No. 1108.
Brand, Plymouth.
Producers, Bangor Packing Co., Bangor.
Retailers, Hedderich Brothers & Co., Williston, N. D.
Lab. No. 1112.
Brand, Millionaire's Club.
Producers, Fenton Brothers & Co., Fenton, N. Y.
Retailers, Jas. Purdon & Co., Wahpeton, N. D.
Lab. No. 1238.
Brand, Pride of Rome.
Producers, Olney Canning Co., Oneida, N. Y.
Retailers, Fargo Grocery Co., Fargo.
Lab. No. 1265.
Brand, White Horse.
Producers, Reid, Murdock & Co., Chicago
Retailers, Fargo Grocery Co., Fargo.
Lab. No. 1271.
Brand, Plymouth.
Producers, Bangor Packing Co., Bangor.
Jobbers, Foley Brothers & Kelly, St. Paul.
Lab. No. 1283.
Brand, Old Colony.
Producers, Faribault Canning Co., Faribault, Minn.
Jobbers, Griggs, Cooper & Co., St. Paul.
Lab. No. 1284.
Brand, Root River.
Producers, Chatfield Canning Co., Chatfield, Minn.
Jobbers, Griggs, Cooper & Co., St. Paul.
Lab. No. 1294.
Brand, Gopher.
Producers, Foley Brothers & Kelly, St. Paul.
Lab. No. 1300.
Brand, Marshalltown.
Producers, Marshalltown Canning Co., Marshalltown, Ia.
Retailers, Foley Brothers & Kelly, St. Paul.

Lab. No. 1302.
Brand, Pride of Rome.
Producers, Olney Brothers, Rome, N. Y
Retailers, Fargo Grocery Co., Fargo.

Lab. No. 1306.
Brand, Succotash, Gopher.
Producers, Foley Brothers & Kelly, St. Paul.

Lab. No. 1347.
Brand, Monarch.
Producers, Reid, Murdock & Co., Chicago.
Retailers, T. E. Yerxa, Fargo.

Lab. No. 1348.
Brand, Tremaine.
Producers, Reid, Murdock & Co., Chicago.
Retailers, T. E. Yerxa, Fargo.

CORN AND SUCCOTASH—ILLEGAL.

Lab. No. 342.
Brand, Extra Choice, Canton.
Producers or jobbers, Canton Canning Co., Canton, Mo.
Retailers, Foley Bros. & Kelly, St. Paul.
Preservative, sulphites.

Lab. No. 348.
Brand, Rockwell.
Producers or jobbers, Rockwell City Canning Co., Rockwell, Ia.
Retailers, Foley Bros. & Kelly, St. Paul.
Preservative, sulphites.

Lab. No. 435.
Producers or jobbers, Anthony Kelly & Co., Minneapolis.
Preservative, sulphites.

Lab. No. 495.
Brand, Faribault Extra Old Colony.
Producers or jobbers, Faribault Canning Co., Faribault, Minn.
Retailers, Klein & Sutmar, Oakes.
Preservative, sulphites.

Lab. No. 545.
Brand, Waldorf.
Producers or jobbers, Metropolitan Canning Co., Rome, N. Y.
Retailers, Wm. O'Hara, Bismarck.
Preservatives, sulphites, saccharin.

Lab. No. 611.
Brand, Newark Sweet Corn.
Producer or jobber, Wayne County Preserving Co., Newark. N. Y.
Retailers, S. S. Moen, Churchs Ferry.
Preservative, sulphites.

Lab. No 620.
Brand, Glenwood.
Producers or jobbers, New Glenwood Canning Co., Glenwood, Ia.
Retailers, Chas. Moore & Son, Grafton, N. D.
Preservatives, sulphites and saccharin..

Lab. No. 652.
Brand, Carol.
Producers, Geo. R. Newell & Co., Minneapolis.
Retailers, W. Crawford & Son, Neche, N. D.
Preservative, large amount of suphites.

Lab. No. 656.
Brand, Plymouth.
Producers, Bangor Packing Co., Bangor, Mo.
Retailers, J. LaMoure, Neche, N. D.
Preservative, contains large amount of sulphite.

Lab. No. 716.
Brand, Log Cabin Succotash.
Producers, F. & I. J. White, Blossvale, N. Y.
Retailers, P. de Fiore, Devils Lake, N. D.
Preservative, contains sulphites.

Lab. No. 765.
Brand, No. A.
Producers, Burt Olney Canning Co., Oneida, N. Y.
Preservatives, sulphites.

Lab. No. 766.
Brand, No. B.
Producers, Burt Olney Canning Co., Oneida, N. Y.
Preservatives, sulphites and saccharin.

Lab. No. 1037.
Brand, Faribault Extra Old Colony.
Producers, Faribault Canning Co., Faribault, Minn.
Retailers, Pure Food Depot, Fargo.
Preservative, formaldehyde.

Lab. No. 1047.
Brand, Vernon.
Producers, Curtice Canning Co., Rochester, N. Y.
Retailers, J. E. Paulson, Hillsboro, N. D.
Preservatives, formaldehyde and saccharin.

Lab. No. 1084.
Brand, Artesian.
Producers, Minnesota Valley Canning Co., Le Sueur, Minn.
Retailer, T. E. Yerxa, Fargo.
Preservative, formaldehyde.

Lab. No. 1093.
Brand, Monarch Succotash.
Producers, Reid, Murdock & Co., Chicago.
Retailers, T. E. Yerxa, Fargo.
Preservative, saccharin.

Lab. No. 1115.
Brand, Blue Label.
Producers, Curtice Brothers, Rochester, N. Y.
Retailers, McKean & Probert, Wahpeton, N. D.
Preservative, saccharin.

Lab. No. 1150.
Brand, Batavia.
Producers, Batavia Preserving Co., Batavia, N. Y.
Retailers, T. E. Yerxa, Fargo.
Preservatives, saccharin.

Lab. No. 1195.
Brand, Early Sweet.
Producers, Curtice Brothers, Rochester, N. Y.
Retailers, F. W. Manns & Son., Devils Lake, N. D.
Preservatives, saccharin.

Lab. No. 1262.
Brand, Monarch.
Producers, Reid, Murdock & Co., Chicago.
Retailers, Fargo Grocery Co., Fargo.
Preservative, saccharin.

Lab. No. 1268.
Brand, U. S.
Producers, U. S. Canning Co., Fredonia, N. Y.
Retailers, Lewis Vidger Loomis, Fargo.
Preservative, saccharin and sulphites.

Lab. No. 1274.
Brand, Alice Rose.
Producers, Fernald Keene & True Co, West Poland, Me.
Retailers, Foley Brothers & Kelly, St. Paul.
Preservative, saccharin.

Lab. No. 1290.
Brand, Glenwood.
Producers, New Glenwood Canning Co., Glenwood, Iowa.
Retailers, Foley Brothers & Kelly, St. Paul.
Preservative, saccharin.

PEAS AND BEANS—LEGAL.

Lab. No. 114.
Brand, Monitor.
Producer or jobber, Lang Canning Co., Eau Claire, Wis.
Retailer, Mr. Grant, Fargo.

Lab. No. 208.
Brand, Barron.
Producer or jobber, N. Wis. Canning Co., Barron, Wis.
Retailer, S. C. Tooker & Co., Minneapolis.

Lab. No. 209.
Brand, Barron.
Producer or jobber, N. Wis. Canning Co., Barron, Wis.
Retailer, S. C. Tooker & Co., Minneapolis.

Lab. No. 210.
Brand, Marrow Fat Barron.
Producer or jobber, N. Wis. Canning Co., Barron, Wis.
Retailer, S. C. Tooker & Co., Minneapolis.

Lab. No. 211.
Brand, Standard Barron.
Producer or jobber, N. Wis. Canning Co., Barron, Wis.
Retailer, S. C. Tooker & Co., Minneapolis.

Lab. No. 279.
Brand, Reynolds Sweet Early June Peas.
Producer or jobber, Reynolds Preserving Co., Sturgeons Bay, Wis.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 281.
Brand, Bengal.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 283.
Brand, Bengal.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 287.
Brand, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.

Lab. No. 315.
Brand, Honey Dew.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.

Lab. No. 316.
Brand, Honey Dew.
Producer or jobber, Erie Preserving Co., Buffalo, N. Y.

Lab. No. 328.
Brand, Barron.
Producer or jobber, N. Wis. Canning Co., Barron, Wis.
Retailer, Foley Bros. Bros. & Kelly, St. Paul.

Lab. No. 336.
Brand, Early June.
Producer or jobber, Fort Atkinson Canning Co., Fort Atkinson, Wisconsin.

Lab. No. 346.
Brand, Little Quaker.
Producer or jobber, W. R. Roach & Co., Hart, Mich.
Retailer, Foley Bros. & Kelly, St. Paul.

Lab. No. 349.
Brand, New York State Beans.
Producer or jobber, Rochester Preserving Co., Rochester, N. Y.
Retailer, Foley Bros. & Kelly, St. Paul.
Lab. No. 352.
Brand, White Wax Beans.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 366.
Brand, Lima No. 10 Beans.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 728A.
Brand, White Horse Peas.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, A. D. Sprague, Devils Lake, N. D.
Lab. No. 739.
Brand, Sweet Garden Peas.
Producer or jobber, Curtice Brothers Co., Rochester, N. Y.
Retailer, F. W. Manns, Devils Lake, N. D.
Lab. No. 764.
Brand, Lakeside Peas.
Producer or jobber, Albert Landreth Co., Manitowoc, Wis.
Retailer, Geo. H. Wilder, Grand Forks.
Lab. No. 777.
Brand, No. C Peas.
Producer or jobber, Burt Olney Canning Co., Oneida, N. Y.
Lab. No. 811.
Brand, Monogram Peas.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Lab. No. 813.
Brand, Monogram Beans.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Lab. No. 843.
Brand, First Quality String Beans.
Producer or jobber, Fisher & Hoen, Baltimore, Md.
Retailer, Park, Grant & Morris, Fargo.
Lab. No. 845.
Brand, First Quality Golden Wax String Beans.
Producer or jobber, J. S. Farren & Co., Baltimore, Md.
Retailer, Park, Grant & Morris, Fargo.
Lab. No. 875.
Brand, Barron Early June Peas.
Producer or jobber, North Wis. Canning Co., Barron, Wis.
Retailer, box car merchant.
Lab. No. 910.
Brand, Petit Pois, Extra Fine.
Producer or jobber, George Dalidet & Co., Bordeaux, France.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 911.
Brand, Lakeside, Champion of England Peas.
Producer, Albert Landreth Co., Manitowoc, Wis.
Retailer, Geo. H. Wilder, Grand Forks.
Lab. No. 1066.
Brand, Genesee County, Refuge Stringless Beans.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1067.
Brand, Telephone Peas.
Producer or jobber, Yerxa Brothers, Minneapolis.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1068.
Brand, Monarch Extra Lima Beans.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1072.
Brand, Monarch Extra String Beans.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1073.
Brand, Four Track Marrow Fat Peas.
Producer or jobber, S. E. DeCoster, Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1077.
Brand, Monarch Kidney Beans.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1079.
Brand, Monarch White Wax Beans.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1083.
Brand, Monarch Extra French String Beans.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1085.
Brand, Batavia French Lima Beans.
Producer or jobber, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1087.
Brand, Batavia Fang Beans.
Producer or jobber, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1088.
Brand, Batavia Telephone Peas.
Producer or jobber, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1127.
Brand, Leopard Early June Peas.
Producer or jobber, Geo. R. Newell & Co., Minneapolis.
Retailer, Newman & Williamson, Grandin, N. D.

Lab. No. 1184.
Brand, Sieward's Pride Lima Beans, Bee Hive Brand.
Producer or jobber, F. H. Sieward & Co., Baltimore, Md.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1187.
Brand, Peerless White Wax Beans.
Producer or jobber, C. H. Pearson Packing Co., Baltimore, Md.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1225.
Brand, U. S. Lima Beans.
Producer or jobber, U. S. Canning Co., Fredonia, N. Y.
Retailer, Lewis Vidger Loomis Co., Fargo.

Lab. No. 1226.
Brand, Shield String Beans.
Producer or jobber, J. S. Farren & Co., Baltimore, Md.
Retailer, Lewis Vidger Loomis Co., Fargo.

Lab. No. 1228.
Brand, Maine's Golden West Lima Bean.
Producer or jobber, Portland Packing Co., Portland, Me.
Retailer, Lewis Vidger Loomis Co., Fargo.

Lab. No. 1258.
Brand, Monarch French String Beans.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co, Fargo.

Lab. No. 1260.
Brand, Monarch Sweet Peas.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co, Fargo.

Lab. No. 1263.
Brand, Reindeer Early June Peas.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co, Fargo.

Lab. No. 1264.
Brand, Reindeer String Beans.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co, Fargo.

Lab. No. 1267.
Brand, Shield Refuge Beans.
Producer or jobber, J. S. Farren & Co., Baltimore, Md.
Retailer, Lewis Vidger Loomis Co., Fargo.

Lab. No. 1277.
Brand, Pride of Rome, Early June Sifted Peas.
Producer or jobber, Olney Canning Co., Oneida, N. Y.
Retailer, Fargo Grocery Co, Fargo.

Lab. No. 1296.
Brand, Fort Snelling Early June Peas.
Producer or jobber, Foley Brothers & Kelly, St. Paul.
Lab. No. 1299.
Brand, Gopher Early June Peas.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 1304.
Brand, Pride of Rome June Peas.
Producer or jobber, Olney Canning Co., Oneida, N. Y.
Retailer, Fargo Grocery Co, Fargo.
Lab. No. 1307.
Brand, Gopher Lima Beans.
Producer or jobber, Foley Bros. & Kelly, St. Paul.

PEAS AND BEANS—ILLEGAL.

Lab. No. 115.
Brand, Valley.
Producer or jobber, Valley Canning Co., Eau Claire, Wis.
Retailer, Mr. Grant, Fargo.
Preservative, borax or boracic acid.
Lab. No. 764.
Brand, Lakeside.
Producer or jobber, Albert Landreth Co., Manitowoc, Wis.
Retailer, Geo. H. Wilder, Grand Forks.
Preservative, gives reaction for formaldehyde.
Lab. No. 778.
Brand, D.
Producer or jobber, Burt Olney Canning Co., Oneida, N. Y.
Preservative, saccharin.
*Lab. No. 793.
Brand, Monogram Beans.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Preservative, formaldehyde, large amount.
*Lab. No. 807.
Brand, University Beans.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Preservative, formaldehyde, large amount.
*Lab. No. 809.
Brand, Monogram Small Stringless Beans.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Preservative, formaldehyde, large amount.
*Lab. No. 810.
Brand, Monogram Refuge Stringless Beans.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Preservative, formaldehyde, large amount.

* In justice to the jobbers, Winston, Harper, Fisher & Co., it should be said the goods were put up for them by the Vodra Canning Co., Wisconsin, to be accepted if they were found free from preservatives and complied with the North Dakota pure food law. The samples were sent by them to us to see if the packers were complying with the law.

*Lab. No. 812.
Brand, University String Beans.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Preservative, formaldehyde, large amount.

Lab. No. 893.
Brand Red Rabbit Sifted Early June Peas.
Producer or jobber, E. J. Vodra Canning Co., Two Rivers, Wis.
Retailer, Park, Grant & Morris, Fargo.
Preservative, borax.

Lab. No. 894.
Brand, Blue Diamond Sweet Wrinkled Marrow Fat Peas.
Producer or jobber, E. J. Vodra Canning Co., Two Rivers, Wis.
Retailer, Park, Grant & Morris, Fargo.
Preservative, borax.

Lab. No. 895.
Brand, Blue Diamond Early June Peas.
Producer or jobber, E. J. Vodra Canning Co., Two Rivers, Wis.
Retailer, Park, Grant & Morris, Fargo.
Preservative, borax.

Lab. No. 1186.
Brand, Our Flag Golden Wax Beans.
Producer or jobber, J. Lloyd Jones Canning Co., Lenox, N. Y.
Retailer, Farmers' Supply House, Fargo.
Preservative, saccharin.

Lab. No. 1227.
Brand, Sweet Wisconsin Early June Peas.
Producer or jobber, Reynolds Preserving Co., Sturgeon's Bay, Wis.
Retailer, Lewis Vidger Loomis Co., Fargo.
Preservative, saccharin.

Lab. No. 1253.
Brand, Petit Pois.
Producer or jobber, Jules Fastier & Co., Bordeaux, France.
Retailer, Fargo Grocery Co, Fargo.
Contains copper, also alum.

Lab. No. 1257.
Brand, Monarch White Wax Beans.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.
Preservative, salicylic acid.

Lab. No. 1261.
Brand, Monarch Early June Peas.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.
Preservative, borax.

* In justice to the jobbers, Winston, Harper, Fisher & Co., it should be said the goods were put up for them by the Vodra Canning Co., Wisconsin, to be accepted if they were found free from preservatives and complied with the North Dakota pure food law. The samples were sent by them to us to see if the packers were complying with the law.

Lab. No. 1266.
Brand, Shield Refuge Beans.
Producer or jobber, J. S. Farren & Co., Baltimore, Md.
Retailer, Lewis Vidger Loomis Co., Fargo.
Preservative, saccharin.

Lab. No. 1272.
Brand, French Peas.
Producer or jobber, Geo. R. Bard, Bordeaux, France.
Retailer, Foley Bros. & Kelly, St. Paul.
Contains copper, also alum.

Lab. No. 1273.
Brand, French Peas.
Producer or jobber, Jules Dupont.
Retailer, Foley Bros. & Kelly, St. Paul.
Contains copper, also alum.

Lab. No. 1291.
Brand, Fairy Early June Peas, W. N. Killer, Cato, Wis.
Producer or jobber, W. N. Killer, Cato, Wis.
Retailer, Foley Bros. & Kelly, St. Paul.
Contains saccharin.

Lab. No. 1295.
Brand, Gopher White Wax Beans.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Contains saccharin.

Lab. No. 1298.
Brand, Fort Snelling White Wax Beans.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Contains saccharin.

Lab. No. 1301.
Brand, Pride of Rome Refuge String Beans.
Producer or jobber, Olney Brothers, Rome, N. Y.
Retailer, Fargo Grocery Co., Fargo.
Contains saccharin.

Lab. No. 1311.
Brand, Fort Snelling Stringless Beans.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Contains saccharin.

TOMATOES, CANNED—LEGAL OR PASSED.

Lab. No. 260.
Brand, Rose Hill.
Producer or jobber, Chas. Webster, East New Market, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 277.
Brand, Maryland Beauties.
Producer or jobber, R. E. Roberts & Co., Baltimore, Md.
Retailer, Griggs, Cooper & Co., St. Paul.

Lab. No. 334.
Brand, Great Western.
Producer or jobber, Great Western Canning Co., Wabash, Ind.
Retailer, Foley Bros. & Kelly, St. Paul.
Lab. No. 728.
Brand, Electric.
Producer or jobber, Elkton Canning Co., Elkton, Md.
Retailer, A. D. Sprague, Devils Lake.
A very inferior product.
Lab. No. 788.
Brand, Golden Crown.
Producer or jobber, Aughinbaugh Canning Co., Baltimore, Md.
Retailer, Nash Bros., Grand Forks.
Lab. No. 789.
Brand, Standard Packing, 1903.
Producer or jobber, Strausberg, Steckel, Hewett & Co., Aberdeen, Maryland.
Retailer, Nash Bros., Grand Forks.
Lab. No. 800.
Brand, Pride of Virginia.
Producer or jobber, L. W. Courtney & Son, Mundy's Point, Md.
Retailer, Nash Bros., Grand Forks.
Lab. No. 711.
Brand, Blue Hen's Chickens.
Producer or jobber, J. S. Reynolds & Co., Frederica, Del.
Retailer, Nimmo Bros., Devils Lake.
(Passed.)
Lab. No. 728.
Brand, Electric.
Producer or jobber, Elkton Canning Co., Elkton, Md.
Retailer, A. D. Sprague, Devils Lake, N. D.
Lab. No. 788.
Brand, Golden Crown.
Producer or jobber, Aughinbaugh Canning Co., Baltimore, Md.
Retailer, Nash Brothers, Grand Forks.
Lab. No. 789.
Brand, Standard.
Producer or jobber, Strausberg, Steckel, Hewitt & Co., Aberdeen, Md.
Retailer, Nash Brothers, Grand Forks.
Lab. No. 800.
Brand, Pride of Virginia.
Producer or jobber, L. W. Courtney & Son, Mundy's Point, Md.
Retailer, Nash Brothers, Grand Forks.
Lab No. 846.
Brand, Diamond.
Producer or jobber, D. D. Scully & Co., Baltimore, Md.
Retailer, Park, Grant & Morris, Fargo.

Lab. No. 852.
Brand, Lady Arundel.
Producer or jobber, Geo. M. Murray, Odenton, Md.
Retailer, Park, Grant & Morris, Fargo.

Lab. No. 876.
Brand, Dame's.
Producer or jobber, S. Frank Dashill, Dame's Quarters, Md.
Retailer, box car merchant.

Lab. No. 916.
Brand, Blue Hen's Chickens.
Producer or jobber, J. S. Reynolds & Co., Frederica, Del.
Retailer, Emerson & Hall, St. Paul, Minn.

Lab. No. 928.
Brand, Clayton.
Producer, Clayton Packing Co., Hartford Co., Md.
Retailer, Grand Forks Mercantile Co., Grand Forks.

Lab. No. 948.
Brand, Warwick.
Producer, Evans & Merritt, Middleton, Del.
Retailer, Park, Grant & Morris, Fargo.

Lab. No. 949.
Brand, Van Camp's.
Producer, Van Camp Packing Co., Indianapolis, Ind.
Retailer, Fargo Mercantile Co., Fargo.

Lab. No. 997.
Brand, Model.
Producer or jobber, C. Meyer & Co., Baltimore, Md.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1021.
Brand, Clay City.
Producer or jobber, Clay City Packing Co., Clay City, Ia.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1061.
Brand, Batavia.
Producer, Batavia Preserving Co., Batavia, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1065.
Brand, Choice.
Producer, Wayne County Preserving Co., Newark, N. Y.
Retailer, T. E. Yerxa, Fargo.

Lab. No. 1118.
Brand, Dixie's Land.
Producer or jobber, Geo. H. Smith, Miskimon, Va.
Retailer, Wright-Clarkson Mercantile Co., Duluth.

Lab. No. 1126.
Brand, Carol.
Producer or jobber, Geo. R. Newell & Co., Minneapolis.
Retailer, Newman & Williamson, Grandin, N. D.

Lab. No. 1230.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.
Lab. No. 1231.
Brand, Gopher.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 1232.
Brand, Wilna.
Producer or jobber, Geo. Accher, Wilna, Md.
Retailer, Foley Bros. & Kelly, St. Paul.
Lab. No. 1234.
Brand, Fort Snelling.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 1235.
Brand, Belmont.
Producer or jobber, W. N. Greenland, Cooptown, Md.
Retailer, Foley Bros. & Kelly, St. Paul.
Lab. No. 1236.
Brand, Big R.
Producer or jobber, Robert Brothers, Snow Hill, Md.
Retailer, Foley Bros. & Kelly, St. Paul.
Lab No. 1237.
Brand, Eledin.
Producer or jobber, Clayton Canning Co., Clayton, Del.
Retailer, Foley Bros. & Kelly, St. Paul.
Lab. No. 1270.
Brand, Reindeer.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Mercantile Co., Fargo.
Lab. No. 1275.
Brand, Pride of Rome.
Producer or jobber, Olney Canning Co., Oneida, N. Y.
Retailer, Fargo Grocery Co., Fargo.
Lab. No. 1364.
Brand, Premium.
Producer or jobber, Twohy Mercantile Co., West Superior, Wis
Retailer, Thompson Brothers, Cooperstown, N. D.

TOMATO CATSUPS—ILLEGAL.

Lab. No. 35.
Producer or jobber, unknown.
Retailer, Lonbakker, Brocket.
Color, coal tar dye.
Lab. No. 36.
Producer or jobber, unknown.
Retailer, Lonbakker, Brocket.
Color, coal tar dye.

Lab. No. 71.
Brand, Van Camp's Tomato.
Producer or jobber, Van Camp Packing Co., Indianapolis, Ind.
Retailer, Berg Brothers, Cooperstown.
Cost, 15c.
Color, coal tar dye.

Lab. No. 181.
Brand, Libby's Tomato.
Producer or jobber, Libby, McNeill & Libby, Chicago, Ill.
Color, coal tar dye.

Lab. No. 212.
Brand, Snider's Home Made.
Producer or jobber, T. A. Snider Preserv. Co., Cincinnati, Ohio.
Retailer, Winston, Harper, Fisher & Co., Minneapolis.
Color, coal tar dye.

Lab. No. 213.
Brand, Tomato.
Producer or jobber, National Pure Food Co., Cincinnati, Ohio.
Retailer, Winston, Harper, Fisher & Co., Minneapolis.
Color, coal tar dye.

Lab. No. 221.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, C. J. Calmer, Fargo.
Color, coal tar dye.

Lab. No. 233.
Brand, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Color, coal tar dye.

Lab. No. 234.
Brand, Colonial.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Color, coal tar dye.

Lab. No. 355.
Brand, No. 16.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Color, coal tar dye.

Lab. No. 356.
Brand, No. 17.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Color, coal tar dye.

Lab. No. 487.
Brand, Ketchup, Sunny Side.
Producer or jobber, Tip Top Ketchup Co., Cincinnati, Ohio.
Retailer, H. V. Hicks & Son, Oakes.
Cost, 15c.
Color, coal tar dye.

Lab. No. 521.
Brand, Minnesota Favorite.
Producer or jobber, M. A. Gedney, St. Paul.
Retailer, Chas. S. Kaufman, Bismarck.
Cost, 15c.
Color, coal tar dye.

Lab. No. 527.
Brand, Butler's Ketchup.
Producer or jobber, Tip Top Ketchup Co., Cincinnati, Ohio.
Retailer, Jamison & Co., Mandan.
Cost, 10c.
Color, coal tar dye.

Lab. No. 549.
Brand, Tiger.
Producer or jobber, Platte & Co., Baltimore, Md.
Retailer, Geo. Gussner, Bismarck.
Cost, 15c.
Color, coal tar dye.

Lab. No. 618.
Brand, Home Comfort.
Producer or jobber, Brant Canning Co., Brant, N. Y.
Retailer, C. T. Studness, Churchs Ferry.
Cost, 15c.
Color, coal tar dye.

Lab No. 703.
Brand, Climax.
Producer or jobber, Chas. F. Louden, Cincinnati, Ohio.
Retailer, Nimmo Bros., Devils Lake.
Color, coal tar dye.

Lab. No. 713.
Brand, Empire.
Producer or jobber, made in St. Louis.
Retailer, P. de Fiore, Devils Lake, N. D.
Preservative, benzoic acid; colored.

Lab. No. 714.
Brand, Eddy's Home Made.
Producer or jobber, Eddy & Eddy, St. Louis, Mo.
Retailer, P. de Fiore, Devils Lake, N. D.
Preservative, benzoic acid; colored.

Lab. No. 729.
Brand, Van Camp Concentrated.
Producer or jobber, Van Camp Packing Co., Indianapolis, Ind.
Retailer, A. D. Sprague, Devils Lake, N. D.
Colored with coal tar dye.

Lab. No. 997.
Brand, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Contains starch.

Lab. No. 958.
Brand, Minnesota Favorite.
Retailer, L. A. Brookes, Larimore, N. D.
Colored with coal tar dye and contains starch.

Lab. No. 977.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Colton Bros., Grand Forks.
Colored with coal tar dye and contains a filler.

Lab. No. 998.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Contains coal tar dye.

Lab. No. 1005.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, O'Hara Cash Grocery, Bismarck, N. D.
Contains coal tar dye.

TOMATO CATSUPS—LEGAL.

Lab. No. 834.
Brand, Waldorf.
Producer or jobber, The Williams Bros. Co., Detroit, Mich.
Retailer, Grand Forks Mercantile Co., Grand Forks.

Lab. No. 888.
Brand, XXXX.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.

Lab. No. 922.
Brand, Snider's Home Made.
Producer or jobber, T. A. Snider Preserving Co, Cincinnati, O.
Retailer, Park, Grant & Morris, Fargo.

Lab. No. 927.
Brand, Van Camp.
Producer, Van Camp Packing Co., Indianapolis, Ind.
Retailer, A. K. Cochram, Finley, N. D.

Lab. No. 1022.
Brand, Our Favorite.
Producer or jobber, Farnham Canning Co., Farnham, N. Y.
Retailer, Park, Grant & Morris, Fargo.

Lab. No. 1023.
Brand, Crown Prince.
Producer or retailer, Erie Preserving Co., Buffalo, N. Y.
Retailer, Park, Grant & Morris, Fargo.

Lab. No. 1032.
Brand, Home Comfort.
Producer or jobber, Brant Canning Co., Brant, N. Y.
Retailer, Nash Bros., Grand Forks.

Lab. No. 1131.
Brand, White House.
Producer or jobber, Jersey Packing Co., Hamittor, Ohio.
Retailer, Geo. R. Newell & Co., Minneapolis.

Lab. No. 1163.
Brand, Flickertail.
Retailer, Fargo Mercantile Co., Fargo.

Lab. No. 1190.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1191.
Brand, Snider's Home Made.
Producer, T. A. Snider Preserving Co., Cincinnati, Ohio.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1205.
Brand, Fort Snelling.
Producer or jobber, Foley Bros. & Kelly, St. Paul.

Lab. No. 1206.
Brand, Gopher.
Producer or jobber, Foley Bros. & Kelly, St. Paul.

Lab. No. 1207.
Brand, Blue Label.
Producer or jobber, Curtice Brothers, Rochester, N. Y.
Retailer, Foley Bros. & Kelly, St. Paul.

Lab. No. 1208.
Brand, Snider's Home Made.
Producer, T. A. Snider Preserving Co., Cincinnati, Ohio.
Jobber, Foley Bros. & Kelly, St Paul.

LEMON EXTRACTS—LEGAL.

Lab. No. 92.
Brand, Extra High Grade.
Producer or jobber, Eddy & Eddy, St. Louis, Mo.
Alcohol, high.
Oil of lemon, 8.23 per cent.
Legal and of high strength oil.

Lab. No. 93.
Brand, Double Strength.
Producer or jobber, Nash Brothers, Grand Forks, N. D.
Alcohol, good.
Oil of lemon, 4.78 per cent.
Not of full strength.

Lab. No. 127.
Brand, Purity Triple.
Producer or jobber, Purity Chemical Co., Chicago, Ill.
Alcohol, good.
Oil of lemon, 5 per cent.
Color, foreign.
This color should be left out to be legal.

Lab. No. 130.
Brand, Concentrated.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Alcohol, high.
Oil of lemon, 5.62 per cent.
Color, ?.

Lab. No. 182.
Brand, Puritan.
Producer or jobber, Park, Grant & Morris, Fargo, N. D.
Alcohol, high.
Oil of lemon, 5.50 per cent.
Color, natural.

Lab. No. 219.
Producer or jobber, Thompson-Taylor Spice Co., Chicago.
Alcohol, high.
Oil of lemon, 5.50 per cent.
Color, natural.

Lab. No. 378.
Brand, Dainty.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
Alcohol, high.
Oil of lemon, 5.93 per cent.

Lab. No. 379.
Brand, B.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Alcohol, good.
Oil of lemon, 4.69 per cent.
Sample below standard and color questionable.

Lab. No. 380.
Brand, A.
Producer or jobber, Griggs, Cooper & Co., St. Paul, Minn.
Alcohol, high.
Oil of lemon, 5 per cent.
Color, natural.

Lab. No. 428.
Brand, Bastine's.
Producer or jobber, Bastine & Co., New York.
Retailer, W. B. Howland, Fargo.
Oil of lemon, 3.12 per cent.
A pure extract, but not of full strength.

Lab. No. 451.
Brand, Imperial.
Producer or jobber, Karles Medicine Co., Aberdeen, S. D.
Retailer, W. A. Cole, Lisbon, N. D.
Oil of lemon, 5.50 per cent.

Lab. No. 586.
Brand, Booth's.
Producer or jobber, Booth's Medicine Co., St. Cloud, Minn.
Retailer, R. B. Griffith, Grand Forks.
Oil of lemon, 10 per cent.

Lab. No. 602.
Brand, Lemon.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Oil of lemon, 5.62 per cent.

Lab. No. 622.
Brand, Gillett's.
Producer or jobber, E. W. Gillett, Chicago.
Retailer, Chas. W. Moore & Son, Grafton.
Oil of lemon, 5.62 per cent.

Lab. No. 629.
Brand, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Retailer, P. A. Jorgenson, Grafton, N. D.
Oil of lemon, 4.72; color, artificial.

Lab. No. 637.
Brand, Fort Snelling.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Retailer, J. LaMoure, Neche, N. D.
Oil of lemon, 6.24 per cent.
Color, natural.

Lab. No. 695.
Brand, Red Dragon.
Producer or jobber, Bell-Conrad Co., Chicago.
Retailers, Devils Lake Co-operative Association.
Oil of lemon, 4.84 per cent.

Lab. No. 721.
Brand, Atlas Triple.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, P. de Fiore, Devils Lake, N. D.
Oil of lemon, 5.18 per cent.

Lab. No. 727.
Brand, Mrs. Foster's.
Producer or jobber, Mrs. Foster, Duluth, Minn.
Retailer, A. D. Sprague, Devils Lake, N. D.
Oil of lemon, 7.50 per cent.

Lab. No. 732.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, W. F. Manns & Son, Devils Lake, N. D.
Oil of lemon, 6.22 per cent; colored.

Lab. No. 783.
Brand, Booth's.
Producer or jobber, Booth Medicine Co., St. Cloud, Minn.
Retailer, E. A. Perry, Fargo, N. D.
Oil of lemon, 10.13 per cent.

Lab. No. 902.
Brand, Sexton's High Grade.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Oil of lemon, 6.25 per cent.

Lab. No. 945.
Brand, Palace.
Producer or jobber, McCormick, Behnke & Co., St. Paul.
Retailer, Chas. Moore & Son, Grafton, N. D.
Oil of lemon, 5.62 per cent.

Lab. No. 959.
Brand, McMurray's.
Producer or jobber, Wm. McMurray & Co., St. Paul.
Retailer, Colton Bros., Grand Forks, N. D.
Oil of lemon, 6.40 per cent.

Lab. No. 989.
Brand, 5 per cent Oil of Lemon.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Oil of lemon, 5.12 per cent.

Lab. No. 1109.
Brand, Schilling's Best.
Retailer, Heddrich Bros. & Co., Williston, N. D.
Oil of lemon, 15.65 per cent.

Lab. No. 1124.
Brand, Newell's Extra.
Producer or jobber, Geo. R. Newell & Co., Minneapolis.
Retailer, Newman & Williamson, Grandin, N. D.
Oil of lemon, 6.06 per cent.

Lab. No. 1340.
Brand, Gillett's Double.
Producer or jobber, E. W. Gillett ,Chicago, Ill.
Retailer, Fargo Grocery Co., Fargo.
Oil of lemon, 5.46 per cent.

Lab. No. 1355.
Brand, Concentrated.
Retailer, Farmers' Supply House, Fargo.
Oil of lemon, 5.65 per cent.

LEMON EXTRACTS—ILLEGAL.

Lab. No. 52.
Brand, Fruit.
Producer or jobber, McCormick, Behnke & Co., St. Paul, Minn.
Alcohol, low.
Oil of lemon, none.
Color, artificial.

Lab. No. 54.
Brand, Palace.
Producer or jobber, McCormick, Behnke & Co., St. Paul, Minn.
Alcohol, low.
Oil of lemon, none.
Color, artificial.

Lab. No. 56.
Brand, Seal.
Producer or jobber, McCormick, Behnke & Co., St. Paul, Minn.
Alcohol, low.
Oil of lemon, none.
Color, artificial.

Lab. No. 64.
Brand, Chapman's.
Producer or jobber, Chapman-Smith Co., Chicago, Ill.
Alcohol, medium.
Oil of lemon, 5.78 per cent.
Color, artificial.
Colored with coal tar dye, but of good strength.

Lab. No. 89.
Brand, Blue Ribbon.
Producer or jobber, Nash Bros., Grand Forks, N. D.
Alcohol, low.
Oil of lemon, none.
Color, artificial.

Lab. No. 131.
Brand, Triple.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Alcohol, low.
Oil of lemon, .62 per cent.
Color, foreign.

Lab. No. 132.
Brand, Climax.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 146.
Brand, Robin.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 147.
Brand, Dainty.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
Alcohol, low.
Oil of lemon, none.

Lab. No. 203.
Brand, Pure.
Producer or jobber, Home Tea Co., Grand Forks, N. D.
Alcohol, low.
Oil of lemon, 2.30 per cent.
Color, coal tar dye.

Lab. No. 220.
Producer or jobber, Thompson-Taylor Spice Co., Chicago.
Alcohol, low.
Oil of lemon, none.
Color, natural.

Lab. No. 307.
Brand, Standard.
Producer or jobber, F. L. Frary & Co., Minneapolis, Minn
Alcohol, low.
Oil of lemon, none.

Lab. No. 308.
Brand, Belmont.
Producer or jobber, F. L. Frary & Co., Minneapolis, Minn.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 375.
Brand, Lagneb.
Producer or jobber, Griggs, Cooper & Co., St. Paul, Minn.
Alcohol, low.
Oil of lemon, .15 per cent.
Color, natural.

Lab. No. 376.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Oil of lemon, none.

Lab. No. 412.
Brand, Sampson's.
Producer or jobber, S. J. Vidger & Co., Fargo, N. D.
Retailer, R. M. Yarrow, Fargo, N. D.
Alcohol, low.
Oil of lemon, .66 per cent.
Color, coal tar dye.

Lab. No. 418.
Brand, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul, Minn.
Sold by Pure Food Depot, Fargo, N. D.
Alcohol, medium.
Oil of lemon, 3.59 per cent.
Color, foreign.
Contains foreign color and below standard.

Lab. No. 422.
Brand, Standard.
Producer or jobber, Standard Chemical Works, St. Louis, Mo.
Sold by Fulton Market, Fargo, N. D.
Alcohol, low.
Oil of lemon, none.
Color, coal tar dye.

Lab. No. 426.
Producer or jobber, Thompson-Taylor Spice Co., Chicago.
Sold by P. J. Bergquist, Fargo, N. D.
Alcohol, low.
Oil of lemon, 1.09 per cent.
Color, coal tar dye

Lab. No. 428.
Brand, Bastine's.
Producer or jobber, Bastine & Co., New York, N. Y.
Retailer, W. B. Howland, Fargo, N. D.
Alcohol, fair.
Oil of lemon, 3.12 per cent.
Color, natural.
Pure, but low in strength.

Lab. No 438.
Brand, Pure Concentrated.
Producer or jobber, M. S. Davis & Co., Lisbon, N. D.
Retailer, M. S. Davis & Co., Lisbon, N. D.
Alcohol, low.
Oil of lemon, .62 per cent
Color, foreign.

Lab. No. 444.
Brand, Jewell Concentrated.
Producer or jobber, Stone, Ordean, Wells & Co., Duluth, Minn.
Retailer, Cramer Bros., Lisbon, N. D.
Alcohol, low.
Oil of lemon, 1.56 per cent.
Color, coal tar dye.

Lab. No. 450.
Brand, Mrs. Baker's.
Producer or jobber, Geo. R. Newell & Co., Minneapolis, Minn.
Retailer, W. A. Cole, Lisbon, N. D.
Alcohol, low.
Oil of lemon, 1.37 per cent.
Color, coal tar dye.

Lab. No. 458.
Brand, Pure Food.
Producer or jobber, Joseph Goodman, Sheldon, N. D.
Retailer, Joseph Goodman, Sheldon, N. D.
Alcohol, low.
Oil of lemon, 1.06 per cent.
Color, foreign.

Lab. No. 462.
Brand, Anchor.
Producer or jobber, ———, St Paul, Minn.
Retailer, A. A. Burgess, Sheldon, N. D.
Alcohol, low.
Oil of lemon, .69 per cent.
Color, coal tar dye.

Lab. No 467.
Brand, Clear Quill.
Producer or jobber, Corbin Sons & Co., Chicago, Ill.
Retailer, M. Gardner, Lisbon, N. D.
Alcohol, good.
Oil of lemon, 5.62 per cent.
Color, foreign.
Of good strength, but colored with what reacts as coal tar dye.

Lab. No. 477.
Brand, Standard.
Producer or jobber, Boston Chemical Works, Boston, Mass.
Retailer, Marion Grange, Sheldon, N. D.
Alcohol, low.
Oil of lemon, .62 per cent.
Color, foreign.

Lab. No. 478.
Brand, Star.
Producer or jobber, Star Extract Co., Chicago, Ill.
Retailer, Marion Grange, Sheldon, N. D.
Alcohol, low.
Oil of lemon, .50 per cent.
Color, coal tar dye.

Lab. No. 483.
Brand, Nichols.
Producer or jobber, unknown.
Retailer, Ramharter Bros., Oakes, N. D.
Alcohol, medium.
Oil of lemon, 1.35 per cent.
Color, natural.
Pure, but of low strength,

Lab. No. 503.
Brand, Concentrated.
Producer or jobber, John Kneen, LaMoure, N. D.
Retailer, Kuch & Zinck, LaMoure, N. D.
Alcohol, medium.
Oil of lemon, 1.12 per cent.
Color, coal tar dye.

Lab. No. 508.
Brand, Jewell Concentrated.
Producer or jobber, Stone, Ordean, Wells & Co., Duluth, Minn.
Retailer, Deisem & Franks, LaMoure, N. D.
Alcohol, medium.
Oil of lemon, 1.50 per cent.
Color, coal tar dye.

Lab. No. 512.
Brand, Our Leader.
Producer or jobber, Hurley Brothers, Forman, N. D.
Retailer, Hurley Brothers, Forman, N. D.
Alcohol, low.
Oil of lemon, .62 per cent.
Color, coal tar dye.

Lab. No. 528.
Brand, Perfection.
Producer or jobber, Atwood & Steele, Chicago, Ill.
Retailer, Chas, Kupitz, Bismarck, N. D.
Alcohol, medium.
Oil of lemon, 1.37 per cent.
Color, foreign.

Lab. No. 532.
Brand, Double Extract.
Producer or jobber, Atwood & Steele, Chicago, Ill.
Retailer, John Yegen, Bismarck, N. D.
Alcohol, medium.
Oil of lemon, 3.44 per cent.
Color, foreign.
Illegal and improperly labeled.

Lab. No. 534.
Brand, Tillman's.
Producer or jobber, Tillman & Bendel, San Francisco, Cal.
Retailer, John Yegen, Bismarck, N. D.
Alcohol, medium.
Oil of lemon, 1.35 per cent.
Color, coal tar dye.

Lab. No. 544.
Brand, Favorite.
Producer or jobber, Winter Spice Co., Chicago., Ill.
Retailer, Wm. O'Hara, Bismarck, N. D.
Alcohol, low.
Oil of lemon, .31 per cent.
Color, foreign.

Lab. No. 550.
Brand, Kent's Nectar.
Producer or jobber, W. H. Kent, St. Paul, Minn.
Retailer, Geo. Gussner, Bismarck, N. D.
Alcohol, medium.
Oil of lemon, 1.35 per cent.
Color, foreign.

Lab No. 551.
Brand, Hoosier.
Producer or jobber, Atwood & Steele, Chicago, Ill.
Retailer, Geo. Gussner, Bismarck, N. D.
Alcohol, low.
Oil of lemon, .62 per cent.
Color, foreign.

Lab. No. 552.
Brand, Pure and True.
Producer or jobber, Minnesota Spice and Mercantile Co., St. Paul.
Retailer, Geo. Gussner, Bismarck, N. D.
Alcohol, medium.
Oil of lemon, 1.35 per cent.
Color, coal tar dye

Lab. No. 560.
Brand, Meldrum's Triple.
Producer or jobber, Geo. Meldrum, Chicago, Ill.
Alcohol, fair.
Oil of lemon, 4.40 per cent.
Color, foreign.

Lab. No. 571.
Brand, Brook's Diamond.
Producer or jobber, L. A. Brooks, Larimore, N. D.
Retailer, Larimore Packing Co., Larimore, N. D.
Alcohol, high.
Oil of lemon, 9.37 per cent.
Color, coal tar dye.
This is exceptionally high in strength, but improperly colored with coal tar color.

Lab. No. 587.
Brand, Double Strength Honest Bottle.
Producer or jobber, Wm. McMurray & Co., St Paul, Minn.
Retailer, R. B. Griffith, Grand Forks, N. D.
Alcohol, medium.
Oil of lemon, 1.06 per cent.
Very low in strength, and colored with what seems to react for coal tar dye.

Lab. No. 593.
Brand, Pure Food.
Producer or jobber, Johnson & McGowan, Grand Forks, N. D.
Retailer, Johnson & McGowan, Grand Forks, N. D.
Alcohol, low.
Oil of lemon, .93 per cent.
Color, foreign.

Lab. No. 596.
Brand, Seely's.
Producer or jobber, Seely Manufacturing Co., Detroit, Mich.
Retailer, W. F. Perry, Grand Forks.
Alcohol, medium.
Oil of lemon, 1.56 per cent.
Color, coal tar dye.

Lab. No. 608.
Brand, Dainty.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
Retailer, S. S. Moen, Churchs Ferry, N. D.
Alcohol, good.
Oil of lemon, 4.38 per cent.
Color, foreign.

Lab. No. 617.
Brand, Souder's.
Producer or jobber, Royal Remedy & Extract Co., Dayton, Ohio
Retailer, C. T. Studness, Churchs Ferry, N. D.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 638.
Brand, Kenwood.
Producer or jobber, Kenwood Mfg. Co., Chicago, Ill.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 644.
Brand, Standard.
Producer or jobber, Grand Forks Mercantile Co.
Retailer, Chas. Moen & Son, Grafton, N. D.
Alcohol, low.
Oil of lemon, .88 per cent.
Color, foreign.

Lab. No. 646.
Brand, Standard.
Producer or jobber, Grand Forks Mercantile Co.
Retailer, W. Crawford & Son, Neche, N. D.
Alcohol, low.
Oil of lemon, 1.25 per cent.
Color, foreign.

Lab. No. 648.
Brand, Standard.
Producer or jobber, Gillett's Chemical Works, Chicago, Ill.
Retailer, W. Crawford & Son, Neche, N. D.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 649.
Brand, Gold Medal.
Producer or jobber, Grand Forks Mercantile Co., Grand Forks
Retailer, W. Crawford & Son, Neche, N. D.
Alcohol, low.
Oil of lemon, .81 per cent.
Color, foreign.

Lab. No. 650.
Brand, Economy.
Producer or jobber, Geo. R. Newell & Co., Minneapolis, Minn.
Alcohol, low.
Oil of lemon, 1.81 per cent.
Color, foreign.

Lab. No. 663.
Brand, Crescent.
Producer or jobber, Lenning, Brown, Wright & Co., Crookston, Minn.
Alcohol, low.
Oil of lemon, .38 per cent.
Color, foreign.

Lab. No. 668.
Brand, Standard.
Producer or jobber, F. L. Frary & Co., Minneapolis, Minn.
Retailer, Murphy, Holmes & Co., Neche, N. D.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 693.
Brand, Columbia.
Producer or jobber, H. B. Straight & Co., St. Paul, Minn.
Retailer, Devils Lake Co-operative Association.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 696.
Brand, Robin.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
Retailer, Devils Lake Co-operative Association.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 705.
Brand, Fruit.
Producer or jobber, McCormick, Behnke & Co., St. Paul, Minn.
Retailer, Nimmo Bros., Devils Lake, N. D.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 719.
Brand, Seal.
Producer or jobber, Kenwood Preserving Co., Chicago, Ill.
Retailer, P. de Fiore, Devils Lake, N. D.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 728A.
Brand, Triple.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Retailer, A. D. Sprague, Devils Lake, N. D.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 731.
Brand, Bengal.
Producer or jobber, not given on package.
Retailer, F. W. Manns & Son, Devils Lake, N. D.
Alcohol, low.
Oil of lemon, none.
Color, foreign.

Lab. No. 737.
Brand, Gillett's Double.
Producer or jobber, E. W. Gillett, Chicago.
Oil of lemon, 5.17 per cent; colored.

Lab. No. 745.
Brand, Blue.
Producer or jobber, Seabury & Co., St. Paul.
Retailer, Monson Brothers & Co., Brocket, N. D.
Oil of lemon, 4.06 per cent.
Colored.

Lab. No. 747.
Brand, Satisfaction Concentrated.
Producer or jobber, Rush Chemical Co.
Retailer, Math Vaboyda, Lawton, N. D.
Oil of lemon, none, and color foreign.

Lab. No. 751.
Producer or jobber, Thompson, Taylor Spice Co., Chicago.
Retailer, Hutchinson & Libby, Lakota, N. D.
Oil of lemon, none, and color foreign.

Lab. No. 780.
Brand, Gold Medal.
Producer or jobber, Grand Forks Mercantile Co., Grand Forks.
Retailer, J. W. Rush.
Oil of lemon, 1.09 per cent, and color foreign.

Lab. No. 781.
Brand, Peerless.
Producer or jobber, Lenning, Brown, Wright & Co., Crookston.
Retailer, J. W. Rush, Chicago.
Oil of lemon, .62 per cent, and color foreign.

Lab. No. 853.
Brand, North Star.
Producer or jobber, Anthony Kelly & Co., Minneapolis.
Oil of lemon, none.

Lab. No. 990.
Brand, No 2.
Producer or jobber, W. H. Kent, St. Paul.
Oil of lemon, none.

Lab. No. 991.
Brand, No. 1.
Producer or jobber, W. H. Kent, St. Paul.
Oil of lemon, none.

Lab. No. 992.
Brand, No. 3.
Producer or jobber, W. H. Kent, St. Paul.
Oil of lemon, none.

Lab. No. 1000.
Brand, Kent's Nectar.
Producer or jobber, W. H. Kent, St. Paul.
Retailer, Andrew Haas, Jamestown.
Oil of lemon, none, and colored.

Lab. No. 1007.
Brand, Tropical.
Producer or jobber, Atwood & Steele, Chicago.
Retailer, G. G. Lyman, Jamestown.
Oil of lemon, none, and colored.

Lab. No. 1008.
Brand, Pure Concentrated.
Producer or jobber, Joseph Skinner & Co., La Crosse, Wis.
Retailer, G. E. Lyman, Jamestown.
Oil of lemon, none, and colored.

Lab. No. 1103.
Brand, Pure Concentrated.
Producer or jobber, Joseph Skinner & Co., La Crosse, Wis.
Oil of lemon, none.

Lab. No. 1105.
Brand, Perfection.
Producer or jobber, Atwood & Steele, Chicago.
Retailer, Bruegger Mercantile Co., Williston, N. D.
Oil of lemon, 3.27 per cent.

Lab. No. 1171.
Brand, One Per Cent.
Retailer, Farmers' Supply House, Fargo.
Oil of lemon, none, and colored with coal tar dye.

Lab. No. 1211.
Brand, Golden Sheaf.
Producer or jobber, Fargo Mercantile Co., Fargo.
Retailer, Fargo Grocery Co., Fargo.
Oil of lemon, 1.56 per cent, and color foreign.

Lab. No. 1239.
Brand, Golden Sheaf.
Producer or jobber, Fargo Mercantile Co., Fargo.
Retailer, Fargo Grocery Co., Fargo.
Oil of lemon, 1.56 per cent.

VANILLA EXTRACTS—LEGAL.

The following extracts have been found to meet the requirements of the pure food law:

Lab. No. 62.
Brand, Chapman's.
Producer or jobber, Chapman-Smith Co., Chicago, Ill.
Of good strength and legal.

Lab. No. 90.
Brand, Eddy's High Grade.
Producer or jobber, Eddy & Eddy, St. Louis, Mo.
A pure vanilla weak in alcohol and held up by alkali.

Lab. No. 133.
Brand, Concentrated.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
A pure product of good strength.

Lab. No. 143.
Brand, Dainty.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
Apparently pure, but of medium alcohol strength and cut with alkali.

Lab. No. 144.
Brand, Blue Ribbon.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
Probably pure, of medium strength alcohol and cut with alkali.

Lab. No. 215.
Brand, Puritan.
Producer or jobber, Park, Grant & Morris, Fargo.
A pure extract of medium strength.

Lab. No. 231.
Brand, No. 1.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Pure and legal.

Lab. No. 413.
Brand, Puritan.
Producer or jobber, Park, Grant & Morris, Fargo, N. D.
Retailer, R. M. Yarrow, Fargo, N. D.
Pure, of good quality and medium strength.

Lab. No. 417.
Brand, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Retailer, Pure Food Depot, Fargo, N. D.
An extract of medium strength, but probably illegally colored.

Lab. No. 421.
Brand, Club House.
Producer or jobber, Franklin, McVeagh & Co., Chicago, Ill.
Retailer, Fulton's Market, Fargo, N. D.
Seems to contain some foreign resin, but of good strength.

Lab. No. 429.
Brand, Bastine's.
Producer or jobber, Bastine & Co., New York.
Retailer, W. B. Howland, Fargo, N. D.
An extract of medium strength.

Lab. No. 430.
Brand, Dr. Price's.
Producer or jobber, Price's Flavoring Extract Co., Chicago, Ill.
An extract of good strength.

Lab. No. 439.
Brand, Jewell Concentrated.
Producer or jobber, Stone, Ordean, Wells Co. Duluth, Minn.
Retailer, M. S. Davis, Lisbon, N. D.
Of medium strength.

Lab. No. 457.
Brand, Golden Sheaf.
Producer or jobber, Fargo Mercantile Co., Fargo, N. D.
Retailer, Joseph Goodman, Sheldon, N. D.
An extract of good strength possibly containing a little color.

Lab. No. 466.
Brand, Clear Quill.
Producer or jobber, Corbin Sons & Co., Chicago, Ill.
Retailer, M. Gardner, Lisbon, N. D.
An extract of good strength.

Lab. No. 470.
Brand, Special.
Producer or jobber, Lakota Manufacturing Co., Chicago, Ill.
Retailer, C. S. Kratt, Sheldon, N. D.
Mainly coumarin, with small amount of vanilla.

Lab. No. 484.
Brand, Our Leader.
Producer or jobber, Ramharter Bros., Oakes, N. D.
Retailer, Ramharter Bros., Oakes, N. D.
Of medium strength, but seems to be slightly colored.

Lab. No. 489.
Brand, Victory.
Producer or jobber, Leach, Gamble, Dexter Co., Wahpeton.
Retailer, H. V. Hicks & Son, Oakes, N. D.
Of good strength.

Lab. No. 504.
Brand, Pure Concentrated.
Producer or jobber, false label.
Retailer, Kuch & Zink, LaMoure, N. D.
Of medium strength, but not properly labeled.

Lab. No. 507.
Brand, Jewell.
Producer or jobber, Stone, Ordean, Wells Co., Duluth, Minn.
Retailer, Deisem & Franks, LaMoure, N. D.
Of medium strength and probably contains some color.

Lab. No. 509.
Brand, Hiawatha.
Producer or jobber, Stone, Ordean, Wells Co., Duluth, Minn.
Retailer, Deisem & Franks, LaMoure, N. D.
Of good strength. Color (?)

Lab. No. 529.
Brand, Pure Concentrated.
Producer or jobber, J. H. Bell & Co., Chicago, Ill.
Retailer, Chas. Kupitz, Bismarck, N. D.
Of good strength. Color (?.)

Lab. No. 553.
Brand, Eddy's Extra High.
Producer or jobber, Eddy & Eddy, St. Louis, Mo.
Of good strength, but colored with caramel.

Lab. No. 590.
Brand, Standard.
Producer or jobber, Grand Forks Mercantile Co., Grand Forks.
Retailer, Geo. Wilder, Grand Forks, N. D.
Of medium strength, colored.

Lab. No. 634.
Brand, Seely's.
Producer or jobber, Seely Manufacturing Co., Detroit, Mich.
Retailer, H. G. Sprague, Grafton, N. D.
Of good strength.

Lab. No. 636.
Brand, Fort Snelling.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Retailer, J. LaMoure & Co., Neche, N. D.
Pure, but not very strong.

Lab. No. 647.
Brand, Standard.
Producer or jobber, Gillett's Chemical Works, Chicago, Ill.
Retailer, W. Crawford & Son, Neche, N. D.
Of good strength, but color questionable.

Lab. No 733.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, F. W. Manns & Son, Devils Lake, N. D.
A pure product of medium strength.

Lab No. 746.
Brand, Blue.
Producer or jobber, Seabury & Co., St Paul, Minn.
Retailer, Monson Bros & Co., Brocket, N. D.
Of medium strength, but probably colored.

Lab. No. 726.
Brand, Vanilla and Tonka.
Producer or jobber, Lakota Manufacturing Co., Chicago, Ill.
Retailer, A. D. Sprague, Devils Lake, N. D.
Colored with caramel.

Lab. No. 734.
Brand, Lagneb.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Retailer, F. W. Manns & Son, Devils Lake.
A poor product, but just as labeled.

Lab. No. 960.
Brand, McMurray's.
Producer or jobber, Wm. McMurray & Co., St. Paul.
Retailer, Colton Brothers, Grand Forks, N. D.
A very weak extract.

Lab. No. 988.
Brand, Extract of Vanilla, Vanillin, Coumarin and Fruit Color.
Producer or jobber, Foley Bros. & Kelly, St. Paul.

Lab. No. 1132.
Brand, Vanilla.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
A good extract.

VANILLA EXTRACTS NOT PROPERLY LABELED AND ILLEGAL.

Lab. No. 51.
Brand, Fruit.
Producer or jobber, McCormick, Behnke & Co., St. Paul, Minn.
An artificial product of coumarin colored with caramel. Illegal.

Lab. No. 53.
Brand, Palace.
Producer or jobber, McCormick, Behnke & Co., St. Paul, Minn.
A product of good strength, but colored with caramel, therefore illegal.

Lab. No. 55.
Brand, Seal.
Producer or jobber, McCormick, Behnke & Co., St. Paul, Minn.
An artificial product colored with caramel, improperly labeled, therefore illegal.

Lab. No. 91.
Brand, Double Strength.
Producer or jobber, Nash Brothers, Grand Forks, N. D.
An artificial product of medium strength.

Lab. No. 94.
Brand, Blue Ribbon,
Producer or jobber, Nash Brothers, Grand Forks, N. D.
An artificial product made from vanillin and coumarin, colored with caramel. Not properly labeled, therefore illegal.

Lab. No. 134.
Brand, Triple.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
An artificial product of vanillin and coumarin colored with caramel. Improperly labeled, therefore illegal.

Lab. No. 135.
Brand, Climax.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis
Largely an artificial product of coumarin or tonka and colored with what appears to be coal tar dye.

Lab. No. 145.
Brand, Robin.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
An artificial extract. Illegal.

Lab. No. 183.
Brand, Puritan.
Producer or jobber, Park, Grant & Morris, Fargo, N. D.
Not made by official method.

Lab. No. 232.
Brand, No 2.
Producer or jobber, Griggs, Cooper & Co., St. Paul, Minn.
Of medium strength, but colored with caramel, therefore not legal.

Lab. No. 309.
Brand, Standard.
Labeled Vanilla and Tonka.
Producer or jobber, F. L. Frary & Co., Minneapolis, Minn.
An artificial product not properly labeled.

Lab. No. 310.
Brand, Belmont.
Producer or jobber, F. L. Frary & Co., Minneapolis, Minn.
An artificial product of vanillin with some tonka or coumarin.

Lab. No. 414.
Brand, Double Strength.
Producer or jobber, S. J. Vidger & Co., Fargo, N. D.
Retailer, R. N. Yarrow, Fargo, N. D.
An artificial extract of coumarin, colored with caramel.

Lab. No. 425.
Brand, Crown.
Producer or jobber, Fargo Mercantile Co., Fargo, N. D.
Retailer, P. J. Bergquist, Fargo, N. D.
It is artificial, largely coumarin and colored with caramel.

Lab. No. 461.
Brand, Anchor.
Producer or jobber, (no name) St. Paul, Minn.
Retailer, A. A. Burgess, Sheldon, N. D.
An artificial product of coumarin, colored with caramel.

Lab. No. 463.
Brand, Bengal.
Producer or jobber, name not given.
Retailer, A. A. Burgess, Sheldon, N. D.
Not pure. Not properly labeled and manufacturers name not given.

Lab. No. 471.
Brand, Gillett's Double.
Producer or jobber, E. W. Gillett, Chicago, Ill.
Retailer, C. S. Kratt, Sheldon, N. D.
Improperly labeled and colored.

Lab. No. 479.
Brand, Banquet.
Producer or jobber, Park, Grant & Morris, Fargo, N. D.
Retailer, Marion Grange, Sheldon, N. D.
An artificial product, mainly coumarin and colored with anilin.

Lab. No. 480.
Brand, Star.
Producer or jobber, Star Extract Co., Chicago, Ill.
Retailer, Marion Grange, Sheldon, N. D.
An artificial product colored with caramel.

Lab. No. 485.
Brand, Double Strength.
Producer or jobber, Ramharter Bros., Oakes, N. D.
Retailer, Ramharter Bros., Oakes, N. D.
Cartoon labeled 2 oz., and bottle labeled 1 oz. Contains coumarin and not properly labeled.

Lab. No. 513.
Producer or jobber, Hurly Bros., Forman, N. D.
Retailers, Hurly Bros., Forman, N. D.
Mainly artificial coumarin, colored.

Lab. No. 533.
Brand, Double Strength.
Producer or jobber, Atwood & Steele, Chicago, Ill.
Retailer, John Yegen, Bismarck, N. D.
Improperly labeled and misleading. Not double strength.

Lab. No. 541.
Brand, Gold Medal.
Producer or jobber, Bismarck Grocery Co.
Contains coumarin and colored with anilin.

Lab. No. 667.
Brand, Vanilla and Tonka.
Producer or jobber, F. L. Frary & Co., Minneapolis, Minn.
Retailer, Murphy, Holmes & Co., Neche, N. D.
An artificial product of coumarin and vanillin and colored with anilin. The top of the box was labeled "Vanilla.."

Lab. No. 694.
Brand, Robin.
Producer or jobber, J. H. Allen & Co., St. Paul, Minn.
Retailer, Devils Lake Co-operative Association.
A very weak extract, colored.

Lab. No. 704.
Brand, Pure.
Producer or jobber (not given), New York, Chicago.
Retailer, Nimmo Bros., Devils Lake, N. D.
An artificial product of coumarin, colored with caramel.

Lab. No. 748.
Brand, Seal.
Producer or jobber, Kenwood Preserving Co., Chicago, Ill.
Retailer, Edmore Mercantile Co., Edmore, N. D.
Colored, of low strength, and illegal.

Lab. No. 750.
Producer or jobber, Thompson-Taylor Spice Co., Chicago, Ill.
Retailer, Hutchins & Libby, Lakota, N. D.
Colored with anilin.

Lab. No. 782.
Brand, Booth's Vanilla and Tonka.
Producer or jobber, name not given.
Retailer, E. A. Perry, Fargo, N. D.
Outer wrapper of package labeled "Vanilla," type not uniform in size and not properly labeled. Manufacturer corrected label on notice from this department.

Lab. No. 870.
Brand, Vanilla.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Good extract, but colored with coal tar dye.

Lab. No. 985.
Brand, Pure.
Producer or jobber, Hudson Mfg. Co., San Francisco, Cal.
Retailer, Greek-American Fruit Co., Grand Forks, N. D.
An artificial product of coumarin and vanillin colored.

Lab. No. 987.
Brand, Vanilla.
Producer or jobber, Foley Bros., & Kelly, St. Paul.
Contains vanillin and coumarin.

Lab. No. 1106.
Brand, Perfection.
Producer or jobber, Atwood & Steele, Chicago.
Retailer, Bruegger Mercantile Co., Williston, N. D.
Of good strength, but colored.

Lab. No. 1157.
Brand, Sexton's.
Producer or jobber, John Sexton & Co., Chicago.
Colored.

VINEGARS—PASSED.

Lab. No. 77.
Brand, Pure Apple Cider.
Producer or jobber, H. J. Heinz & Co., Pittsburg, Pa.
Retailer, Fred Blumer, Ellendale, N. D.
Specific gravity, 1.022; per cent acid, 4.95; solids, 2.82; ash, .25.

Lab. No. 78.
Brand, Pure Apple Juice.
Producer or jobber, S. R. & I. C. Motts, St. Louis, Mo.
Retailer, Fred Blumer, Ellendale, N. D.
Specific gravity, 1.020; per cent acid, 5.80; solids, 2.87; ash, .34.

Lab. No. 128.
Brand, N. Y. State Cider.
Producer or jobber, Wright-Clarkson Mercantile Co., Duluth, Minn.
Specific gravity, 1.022; per cent acid, 4.85; solids, 2.66; ash, .36.

Lab. No. 193.
Brand, Cider.
Producer or jobber, Genesee Fruit Co., Lansing, Mich.
Retailer, Geo R. Newell & Co., Minneapolis, Minn.
Specific gravity, 1.017; per cent acid, 5.127; solids 2.34. ash .28.

Lab. No. 322.
Brand, Apple Cider.
Producer or jobber, Jerse Norton, Duluth, Minn.
Specific gravity, 1.020; per cent acid, 4.70; solids, 2.77; ash, .29.

Lab. No. 323.
Brand, Cider.
Producer or jobber, O. L. Gregory, Paducah, Ky.
Retailer, Fargo Mercantile Co., Fargo, N. D.
Specific gravity, 1,020; per cent acid, 4.85; solids, 2.66; ash, .38.

Lab. No. 396.
Brand, Pure Cider.
Producer or jobber, Natz & Co.
Retailer, Fred Blumer, Ellendale, N. D.
Specific gravity, 1.019; per cent acid, 4.97; solids, 2.72; ash, .29.

Lab. No. 437.
Brand, Cider.
Producer or jobber, Clarkville Cider Co., Clarkville, Mo.
Retailer, M. T. Davis & Co., Lisbon, N. D.
Specific gravity, 1.020; per cent acid, 3.87; solids, 4.23; ash, .18.

Lab. No. 465.
Brand, Amazon Cider.
Made at Davenport, Ia.
Retailer, M. Gardner, Lisbon, N. D.
Specific gravity, 1.020; per cent acid, 4.77; solids, 3.08; ash, .10.

Lab. No. 566.
Brand, Pure Cider.
Producer or jobber, Bismarck Grocery Co.
Per cent acids, 5.25; solids, 2.79; ash, .33.

Lab. No. 599.
Brand, Elko Cider.
Producer or jobber, Wallace & Gregory, Paducah, Ky.
Retailer, Fargo Grocery Co., Fargo, N. D.
Specific gravity, 1.022; per cent acid, 4.77; solids, 2.97; ash, .36.

Lab. No. 725.
Brand, Cider.
Producer or jobber, M. A. Gedney, St. Paul, Minn.
Retailer, A. D. Sprague, Devils Lake, N. D.
Specific gravity, 1.019; per cent acid, 5.20; solids, 2.49; ash, .28.

Lab. No. 749.
Brand, Cider.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis, Minn.
Retailer, Scott & Barrett Mercantile Co., Lakota, N. D.
Specific gravity, 1,015; per cent acid, 5.10; solids, 2.43; ash, .23.

Lab. No. 785.
Brand, Pure Cider.
Producer or jobber, Burdick & Lincoln, Fargo, N. D.
Specific gravity, 1.019; per cent acid, 4.70; solids, 2.45; ash, .50.

VINEGARS—LEGAL.

Lab. No. 298.
Brand, Cider.
Producer or jobber, unknown.
Retailer, T. E. Yerxa, Fargo, N. D.
Specific gravity, 1.0225; per cent acid, 4.58; solids, 3.92; ash, .45

Lab. No. 416.
Brand, Home.
Producer or jobber, Griggs, Cooper & Co., St. Paul, Minn.
Retailer, Pure Food Depot, Fargo, N. D.
Specific gravity, 1.020; per cent acid, 5.35; solids, 3.35; ash, .73.

Lab. No. 420.
Brand, Cider.
Producer or jobber, S. R. & J. C. Motts, St. Louis, Mo.
Retailer, Fulton's Market, Fargo, N. D.
Specific gravity, 1.015; per cent acid, 4.70; solids, 2.45; ash, .23.

Lab. No. 427.
Brand, Cider.
Producer or jobber, H. J. Heinz & Co., Pittsburg, Pa.
Retailer, W. B. Howland, Fargo, N. D.
Specific gravity, 1.020; per cent acid, 4.95; solids, 2.59; ash, .25.

Lab. No. 454.
Brand, Cider.
Producer or jobber, Clarkville Vinegar Co., Clarkville, Mo.
Retailer, C. Durgin, Sheldon, N. D.
Specific gravity, 1.020; per cent acid, 4.10; solids, 3.65; ash, .27.

Lab. No. 474.
Brand, Apple Cider.
Producer or jobber, S. R. & J. C. Motts, St. Louis, Mo.
Retailer, M. Grange, Sheldon, N. D.
Specific gravity, 1.020; per cent acid, 4.75; solids, 2.79; ash, .24.

Lab. No. 475.
Brand, Cider.
Producer or jobber, H. J. Heinz & Co., Pittsburg, Pa.
Retailer, M. Grange, Sheldon, N. D.
Specific gravity, 1.020; per cent acid, 5.50; solids, 2.70; ash, .40.

Lab. No. 494.
Brand, Cider.
Producer or jobber, Griggs, Cooper & Co., St. Paul, Minn.
Retailer, Klein & Sutmar, Oakes, N. D.
Specific gravity, 1.025; per cent acid, 5.87; solids, 3.30; ash, .47.

Lab. No. 499.
Brand, Cider.
Producer or jobber, H. J. Heinz & Co., Pittsburg, Pa.
Retailer, Cunningham & Lawrence, LaMoure, N. D.
Specific gravity, 1.020; per cent acid, 4.82; solids, 2.71; ash, .37.

Lab. No. 506.
Brand, Cider.
Producer or jobber, S. R. & J. C. Motts, St. Louis, Mo.
Retailer, Deisem & Franks, LaMoure, N. D.
Specific gravity, 1.020; per cent acid, 4.75; solids, 2.58; ash, .28.

Lab. No. 520.
Brand, Cider.
Producer or jobber, F. C. Johnson, Kishwaukee, Wis.
Retailer, McGillic Grocery Co., Mandan, N. D.
Specific gravity, 1'.020 ; per cent acid, 4.87 ; solids, 2.01 ; ash, .36.

Lab. No. 526.
Brand, Cider.
Producer or jobber, Bismarck Grocery Co., Bismarck, N. D.
Retailer, Jamison & Co., Mandan, N. D.
Specific gravity, 1.020 ; per cent acid, 4.80 ; solids, 2.61 ; ash, .41.

Lab. No. 567.
Brand, Cider.
Producer or jobber, Grand Forks Mercantile Co., Grand Forks, N. D.
Retailer, L. Stern, Larimore, N. D.
Specific gravity, 1.020 ; per cent acid, 4.85 ; solids, 2.76 ; ash, .23.

Lab No. 576.
Brand, Cider.
Producer or jobber, Genesee Vinegar Co., Lansing, Mich.
Retailer, C. H. Howland, Grand Forks, N. D.
Specific gravity, 1.020 ; per cent acid, 4.62 ; solids, 2.37 ; ash, .32.

Lab. No. 580.
Brand, Cider.
Producer or jobber, Genesee Vinegar Co., Lansing, Mich.
Retailer, M. W. Hansen & Co., Grand Forks, N. D.
Specific gravity, 1.020 ; per cent acid, 4.60 ; solids, 2.77 ; ash, .33.

Lab. No. 588.
Brand, Cider.
Producer or jobber, Genesee Vinegar Co., Lansing, Mich.
Retailer, R. B. Griffith, Grand Forks, N. D.
Specific gravity, 1.017 ; per cent acid, 4.42 ; solids, 2.80 ; ash, .33.

Lab. No. 589.
Brand, Cider.
Producer or jobber, Genesee Vinegar Co., Lansing, Mich.
Retailer, Geo. H. Wilder, Grand Forks, N. D.
Specific gravity, 1.017 ; per cent acid, 4.50 ; solids, 2.88 ; ash, .33.

Lab. No. 591L.
Brand, Cider.
Producer or jobber, Genesee Vinegar Co., Lansing, Mich.
Retailer, K. M. Nass & Co., Grand Forks, N. D.
Specific gravity, 1.020 ; per cent acid, 4.72 ; solids, 2.70 ; ash, .40.

Lab. No. 592.
Brand, Cider.
Producer or jobber, H. J. Heinz & Co., Pittsburg, Pa.
Retailer, Johnson & McGowen, Grand Forks, N. D.
Specific gravity, 1.012 ; per cent acid, 5.22.

Lab. No. 598.
Producer or jobber, unknown.
Retailer, C. J. Calmer, Fargo, N. D.
Per cent acid, 4.25; solids, 2.31; ash, .26.

Lab. No. 635.
Brand, Cider.
Producer or jobber, F. C. Johnson, Kishwaukee, Wis.
Retailer, H. J. Sprague, Grafton, N. D.
Specific gravity, 1.017; per cent acid, 5.45; solids, 1.95; ash, .34.

Lab No. 744.
Brand, Pure Apple.
Producer or jobber, Barrett & Barrett, St. Paul, Minn.
Retailer, Pinkerton & Kellogg, Lakota, N. D.
Specific gravity, 1.018; per cent acid, 4.63; solids, 2.39; ash, .40.

Lab. No. 759A.
Brand, Cider.
Producer or jobber, O. L. Gregory, Paducah, Ky.
Retailer, R. M. Yarrow, Fargo, N. D.
Specific gravity, 1.018; per cent acid, 4.35; solids, 2.68; ash, .36.

Lab. No. 779.
Brand, Cider.
Producer or jobber, O. L. Gregory, Paducah, Ky.
Retailer, Grand Forks Mercantile Co., Grand Forks, N. D.
Specific gravity, 1.020; per cent acid, 4.87; solids, 2.93; ash, .36.

Lab. No. 798.
Brand, Cider.
Producer or jobber, Nash Bros., Grand Forks.
Specific gravity, 1.018; per cent acid, 4.77; solids, 2.68; ash, .11.

Lab. No. 805.
Brand, Cider.
Producer or jobber, M. A. Gedney Pickling Co., Minneapolis.
Specific gravity, 1,020; per cent acid, 4.80; solids, 2.22; ash, .27.

Lab. No. 806.
Brand, Cider.
Producer or jobber, W. A. Crawford & Son, Neche, N. D.
Per cent acid, 4.63; solids, 1.92; ash, .35.

Lab. No. 832.
Brand, Cider.
Producer or jobber, H. G. Sprague & Co., Grafton, N. D.
Specific gravity, 1.021; per cent acid, 4.95; solids, 2.72; ash, .38.

Lab. No. 838.
Brand, Cider.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Specific gravity, 1.019; per cent acid, 4.62; solids, 3.27; ash, .38.

Lab. No. 877.
Brand, Cider.
Producer or jobber, M. A. Gedney Pickling Co., St. Paul.
Specific gravity, 1.015; per cent acid, 4.45; solids, 2.51; ash, .43.

Lab. No. 947.
Brand, Cider.
Producer or jobber, Lenning, Brown, Wright & Co., Crookston.
Specific gravity, 1.0175; per cent acid, 5.64; solids, 2.54; ash, .46

Lab. No. 1046.
Brand, Cider.
Producer or jobber, M. A. Gedney Pickling Co., Minneapolis.
Retailer, J. E. Paulson, Hillsboro.
Specific gravity, 1.015; per cent acid, 5.25; solids, 2.45; ash, .41.

Lab. No. 1052.
Brand, Cider.
Producer or jobber, Farmer in New York.
Retailer, P. S. Peterson, Hillsboro.
Specific gravity, 1.017; per cent acid, 5.58; solids, 3.14; ash, .27.

Lab. No. 1098.
Brand, Cider.
Producer or jobber, Stone, Ordean, Wells Co., Duluth, Minn.
Specific gravity, 1.022; per cent acid, 5.55; solids, 3.73; ash, .28.

Lab. No. 1136.
Brand, Cider.
Producer or jobber, Barrett & Barrett.
Retailer, Melhouse & Ohnstad, Denbigh, N. D.
Specific gravity, 1.0155; per cent acids, 4.90; solids, 2.07; ash, .32

Lab. No. 1156.
Brand, French.
Producer or jobber, L. A. Price, Bordeaux, France.
Retailer, Grand Forks Mercantile Co.
Specific gravity, 1.010; per cent acid, 6.87; solids, 3.58; ash, .04.

Lab. No. 1172.
Brand, Cider.
Producer or jobber, Farmers' Supply House, Fargo.
Per cent acid, 5.02; solids, 2.64; ash, .54.

Lab. No. 1199.
Brand, Cider.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Retailer, Jimeson & Olson, Cooperstown.
Specific gravity, 1.020; per cent acid, 5.12; solids, 3.32; ash, .27.

Lab. No. 1200.
Brand, Cider.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Retailer, Jimeson & Olson, Cooperstown.
Per cent acid, 6.25.

Lab. No. 1356.
Brand, Cider.
Producer or jobber, Gowan, Peyton, Twohy & Co., Duluth, Minn.
Per cent acid, 4.79; solids, 3.59; ash, .47.

VINEGARS—ILLEGAL.

Lab. No. 75.
Brand, Cider.
Producer or jobber, O. L. Gregory, Paducah, Ky.
Retailer, Patron's Exchange, Bottineau, N. D.
Specific gravity, 1.014; per cent acid, 5.15; solids, .56; ash, .17.
Colored.

Lab. No. 76.
Brand, Prime Apple.
Producer or jobber, M. A. Gedney, St. Paul.
Retailer, Patron's Exchange, Bottineau, N. D.
Specific gravity, 1.011; per cent acid, 4.80; solids, .52; ash, .09.
Colored.

Lab. No. 87.
Brand, Amazon Cider
Producer or jobber, unknown.
Retailer, Nash Bros., Grand Forks, N. D.
Specific gravity, 1.020; per cent acid, 4.55; solids, 2.99; ash, .09.
Colored.

Lab. No. 95.
Brand, White Wine.
Producer or jobber, unknown.
Retailer, Nash Bros., Grand Forks, N. D.
Specific gravity, 1.022; per cent acid, 9.52; solids, .41; ash, trace

Lab. No. 112.
Brand, White Wine.
Producer or jobber, A. M. Richter & Son, Manitowoc, Wis.
Retailer, Mr. Grant, Fargo.
Specific gravity, 1.017; per cent acid, 9.45; solids, .35; ash, trace.

Lab. No. 140.
Brand, Pure Cider.
Producer or jobber, Knight, Stanley, Finney Co., Casselton, N. D.
Specific gravity, 1,011; per cent acid, 5.79; solids, 1.64; ash, .14.
Colored.

Lab. No. 141.
Brand, Cider.
Producer or jobber, M. A. Gedney, St. Paul.
Retailer, Geo. H. Wilder, Grand Forks, N. D.
(Too small sample.) Per cent acid, 5.42; solids, 1.62; ash, .17.
Colored.

Lab. No. 194.
Brand, White Wine.
Producer or jobber, unknown.
Retailer, Geo. R. Newell & Co., Minneapolis.
Specific gravity, 1,0125; per cent acid, 4.68; solids, 17; ash, trace.

Lab. No. 216.
Brand, Cider.
Producer or jobber, Cote Bros., St. Louis, Mo.
Retailer, Jurgens Bros., Fargo.
Specific gravity, 1.005; per cent acid, 4.85; solids, .48; ash, .02.
Colored.

Lab. No. 394.
Brand, Cider.
Producer or jobber, Karl Birk, Moorhead, Minn.
Specific gravity, 1.0175; per cent acid, 3.77; solids, 3.13; ash, .41.

Lab. No. 411.
Brand, Cider.
Producer or jobber, unknown.
Retailer, R. M. Yarrow, Fargo.
Specific gravity, 1.010; per cent acid, 1.75; solids, 2.22; ash, .27.

Lab. No. 415.
Brand, Cider.
Producer or jobber, unknown.
Retailer, Anderson & Co., Fargo.
Specific gravity, 1.010; per cent acid, 4.75; solids, .43; ash, trace.
Colored.

Lab. No. 424.
Brand, Apple Cider.
Producer or jobber, M. A. Gedney, St. Paul.
Retailer, P. J. Bergquist, Fargo.
Specific gravity, 1.014; per cent acid, 4.62; solids, .43; ash, .01.
Colored.

Lab. No. 443.
Brand, Cider.
Producer or jobber, Cote Bros., St. Louis, Mo.
Retailer, Cramer Bros., Lisbon, N. D.
Specific gravity, 1.015; per cent acid, 4.43; solids, .37; ash, .03.
Colored.

Lab. No. 455.
Brand, Cider.
Producer or jobber, unknown.
Retailer, Joseph Goodman, Sheldon, N. D.
Specific gravity, 1.010; per cent acid, 5.00; solids, .48; ash, .03.
Colored.

Lab. No. 469.
Brand, 45 Grains.
Producer or jobber, Winston, Harper, Fisher & Co., Minneapolis.
Retailer, C. S. Kratt, Sheldon, N. D.
Specific gravity, 1.015; per cent acid, 4.37; solids, .63; ash, .05.
Colored.

Lab. No. 486.
Brand, Cider.
Producer or jobber, Clarkville Vinegar Co., Clarkville, Mo.
Retailer, Ramharter Bros., Oakes, N. D.
Specific gravity, 1.015; per cent acid, 4.00; solids, 1.28; ash. 10.
Colored.

Lab. No. 502.
Brand, Cider.
Producer or jobber, unknown.
Retailer, Kuch & Zinck, LaMoure, N. D.
Specific gravity, 1.015; per cent acid, 5.11; solids, .68; ash, .11.
Colored.

Lab. No. 514.
Brand, Cider.
Producer or jobber, Cote Bros., St. Louis, Mo.
Retailer, Hurly Bros., Forman, N. D.
Specific gravity, 1.013; per cent acid, 4.75; solids, .48; ash, .05.
Colored.

Lab. No. 536.
Brand, Double Strength.
Producer or jobber, unknown.
Retailer, J. C. Swett, Bismarck, N. D.
Specific gravity, 1.020; per cent acid, 9.11; solids, .71; ash, .04.
Colored.

Lab. No. 538.
Brand, Cider.
Producer or jobber, M. A. Gedney, St. Paul.
Retailer, H. L. Michelson, Bismarck, N. D.
Specific gravity, 1.015; per cent acid, 5.12; solids, 1.51; ash, .14.
Colored.

Lab. No. 543.
Brand, Cider.
Producer or jobber, M. A. Gedney, St. Paul.
Retailer, Wm. O'Hara, Bismarck, N. D.
Specific gravity, 1.0175; per cent acid, 5.75; solids, .96; ash, .13.
Colored.

Lab. No. 547.
Brand, Cider.
Producer or jobber, unknown.
Retailer, Geo. Gussner, Bismarck, N. D.
Specific gravity, 1.015; per cent acid, 5.12; solids, .73; ash, .09.
Colored.

Lab. No. 557.
Brand, Cider.
Producer or jobber, unknown.
Retailer, box car, Geo. Meldrum.
Specific gravity, 1.009; per cent acid, 3.88; solids, .31; ash, .05.
Colored.

Lab. No. 570.
Brand, Amazon.
Producer or jobber, Nash Bros., Grand Forks, N. D.
Retailer, Larimore Packing Co.
Specific gravity, 1.020; per cent acid, 4.45; solids, 3.55; ash, .10.
Colored.

Lab. No. 577.
Brand, Amazon.
Made at Davenport, Ill.
Retailer, Salstad & Booker, Grand Forks, N. D.
Specific gravity, 1.020; per cent acid, 4.55; solids, 2.75; ash, .12.
Colored.

Lab. No. 597.
Brand, Cider.
Producer or jobber, Nash Bros., Grand Forks, N. D.
Retailer, W. F. Perry, Grand Forks, N. D.
Specific gravity, 1.012; per cent acid, 4.87; solids, .33; ash, .04.
Colored.

Lab. No. 630.
Brand, Cider.
Producer or jobber, M. A. Gedney, St. Paul.
Retailer, P. A. Jorgenson, Grafton, N. D.
Specific gravity, 1.016; per cent acid, 6.88; solids, .55; ash, .04.
Colored.

Lab. No. 657.
Brand, Cider.
Producer or jobber, M. A. Gedney, St. Paul, Minn.
Retailer, W. Crawford & Son, Neche, N. D.
Specific gravity, 1.009; per cent acid, 4.05; solids, .61; ash, .11.
Colored.

Lab. No. 658.
Brand, Cider.
Producer or jobber, O. L. Gregory, Paducah, Ky.
Retailer, W. Crawford & Son, Neche, N. D.
Specific gravity, 1.017; per cent acid, 5.80; solids, .82; ash, .12.
Colored.

Lab. No. 662.
Brand, Cider.
Producer or jobber, Red Cross Co., St. Louis, Mo.
Retailer, D. W. Young, Neche, N. D.
Specific gravity, 1.011; per cent acid, 4.58; solids, .19; ash, trace
Colored.

Lab. No. 671.
Brand, Cider.
Made at Davenport, Ia.
Retailer, Murphy, Holmes & Co., Neche, N. D.
Specific gravity, 1.012; per cent acid, 5.25; solids, .22; ash, .03.
Colored.

Lab. No. 718.
Brand, Cider.
Producer or jobber, Cote Bros., St. Louis, Mo.
Retailer, P. de Fiore, Devils Lake, N. D.
Specific gravity, 1.012; per cent acid, 5.43; solids, .36; ash, trace
Colored.

Lab. No. 786.
Brand, White Wine.
Producer or jobber, Burdick & Lincoln, Fargo, N. D.
Specific gravity, 1.018; per cent acid, 9.12; solids, .29; ash, trace

Lab. No. 786.
Brand, White Wine.
Producer or jobber, Burdick & Lincoln, Fargo, N. D.
Specific gravity, 1.018; per cent acid, 9.12; solids, .29; ash, trace

Lab. No. 1045.
Brand, Cider.
Producer or jobber, M. A. Gedney Pickling Co., Minneapolis.
Retailer, J. E. Paulson, Hillsboro, N. D.
Specific gravity, 1.015; per cent acid, 6.30; solids, 1.14; ash, .12.
Colored.

MISCELLANEOUS—LEGAL OR PASSED.

Lab. No. 85.
Brand, Selected Gherkins.
Producer or jobber, Nash Bros., Grand Forks.

Lab. No. 86.
Brand, Home Comfort Olives.
Producer or jobber, Nash Bros., Grand Forks.

Lab. No. 116.
Brand, Monitor Sweet Pie Pumpkin.
Producer or jobber, Lange Canning Co., Eau Claire, Wis.
Retailer, Mr. Grant, Fargo.

Lab. No. 173.
Brand, Peerless Plum Pudding.
Producer or jobber, Libby, McNeal & Libby.

Lab. No. 177.
Brand, Pork and Beans, Baked.
Producer or jobber, Libby, McNeal & Libby.
Lab. No. 247.
Brand, Booth's Baked Beans.
Producer, A. Booth & Co., Baltimore, Md.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 248.
Brand, Oval Boston Baked Beans.
Producer, A. Booth & Co., Baltimore, Md.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 249.
Brand, Boston Van Camp Pork and Beans.
Producer, Van Camp Packing Co., Indianapolis, Ind.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 250.
Brand, Home Baked Beans.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 258.
Brand, Bengal Sweet Potatoes.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 265.
Brand, French Garden Spinach.
Producer, Potter & Wrightington, Boston, Mass.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 268.
Brand, Home Pumpkin.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 276.
Brand, Flat Rock Pumpkin.
Producer, at Flat Rock, Indiana.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 278.
Brand, Oval Sweet Potatoes.
Producer, A. Booth & Co., Baltimore, Md.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 303.
Brand, Home Asparagus.
Jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 330.
Brand, Cedar Sweet Potatoes.
Producer, W. L. Stevens & Brothers, Cedarville and Cape May, N. J.
Jobber, Foley Bros. & Kelly, St. Paul.
Lab. No. 645.
Brand, Leopard Sweet Pickles.
Producer or jobber, Geo. R. Newell & Co., Minneapolis.
Retailer, W. Crawford & Son, Neche, N. D.

Lab. No. 856.
Brand, Home Chow Chow.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 857.
Brand, Bengal Chow Chow.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 858.
Brand, Home Salad Dressing.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 859.
Brand, Bengal Chili Sauce.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Lab. No. 961.
Brand, Strained Honey.
Retailer, Soudrall Brothers, Warren, N. D.
Lab. No. 962.
Brand, Honey.
Retailer, Reuben B. Crouse.
Lab. No. 1017.
Brand, Honey.
Retailer, Chas. Kupitz, Bismarck.
Lab. No. 1043.
Brand, Randolph Golden Pumpkin.
Producer or jobber, Randolph Canning Co., Randolph, Wis.
Retailer, Fargo Mercantile Co., Fargo.
Lab. No. 1058.
Brand, U. S. Beets, California Strawberry.
Producer or jobber, U. S. Canning Co., Fredonia, N. Y.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1059.
Brand, Monarch Asparagus.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1086.
Brand, Clay City Pumpkin.
Producer or jobber, Clay City Canning Co., Clay City, Ia.
Retailer, T. E. Yerxa, Fargo.
Lab. No. 1114.
Brand, Libby's Premier Tomato Soup.
Producer or jobber, Libby, McNeal & Libby, Chicago.
Retailer, McKean & Probert, Wahpeton.
Lab. No. 1117.
Brand, Honey.
Retailer, Thos. Elliott, Grandin, N. D.
Lab. No. 1122.
Brand, No. A Beets.
Producer or jobber, Olney Brothers, Oneida, N. Y.

Lab. No. 1175.
Brand, Booth's Boston Baked Beans.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1176.
Brand, Booth's Boston Baked Beans.
Producer or jobber, A. Booth & Co., Baltimore, Md.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1177.
Brand, Columbia Evaporated Cream.
Producer or jobber, Borden Condensed Milk Co., New York.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1179.
Brand, Economy Evaporated Cream.
Producer or jobber, Helvetia Milk Condensing Co., Highland, Ill.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1188.
Brand, Randolph Golden Pumpkin.
Producer or jobber, Randolph Canning Co., Randolph, Wis.
Retailer, Farmers' Supply House, Fargo.

Lab. No. 1192.
Brand, Monarch Asparagus.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1198.
Brand, Van Camp's Vegetable Soup.
Producer or jobber, Van Camp Packing Co., Indianapolis, Ind.
Retailer, Fargo Mercantile Co., Fargo.

Lab. No. 1229.
Brand, U. S. Snowball Cauliflower.
Producer or jobber, U. S. Canning Co., Fredonia, N. Y.
Retailer, Lewis Vidger Loomis Co. Fargo.

Lab. No. 1276.
Brand, Pride of Rome Custard Pumpkin.
Producer or jobber, Olney Canning Co., Oneida, N. Y.
Retailer, Fargo Grocery Co., Fargo, N. D.

Lab. No. 1297.
Brand, Oval Cheese.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1305.
Brand, Monarch Asparagus.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1313.
Brand, Monarch Squash.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1314.
Brand, Reindeer White Hominy.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Fargo Grocery Co., Fargo.

Lab. No. 1319.
Brand, Gopher Sweet Potatoes.
Producer or jobber, Foley Bros. & Kelly, St. Paul.

Lab. No. 1321.
Brand, Shield Spinach.
Producer or jobber, J. S. Farren & Co., Baltimore, Md.
Retailer, Lewis Vidger Loomis Co., Fargo.

Lab. No. 1322.
Brand, Tomato Soup.
Producer, Franco-American Food Co., Jersey City Heights, N. J.

MISCELLANEOUS—ILLEGAL.

Lab. No. 1197.
Brand, Van Camp's Tomato Soup.
Producer or jobber, Van Camp Packing Co., Indianapolis, Ind.
Retailer, Fargo Mercantile Co., Fargo.
Colored with coal tar dye.

Lab. No. 1282.
Brand, Raspberry Jellycon.
Producer or jobber, E. S. Burnham Co., New York.
Retailer, Baldwin & Thompson, Fargo.
Colored with coal tar dye.

Lab. No. 1343.
Brand, Leaf Green.
Retailer, Fargo Grocery Co., Fargo.
Colored with coal tar dye.

Lab. No. 1377A.
Brand, Horseshoe Butter.
Producer or jobber, Bjoyge, Wangensler & Co., Lake Park.
Retailer, Fargo Grocery Co., Fargo.
Preservative, borax.

BEVERAGES—ILLEGAL.

Lab. No. 41.
Brand, Welch's,
Producer or jobber, Welch Grape Juice Co., Westfield, N. Y.
Preservative, salicylic acid.

Lab. No. 58.
Brand, Concord Unfermented.
Producer or jobber, Fremont Grape Juice Co., Fremont, Ohio.
Retailer, Pure Food Depot, Fargo.
Preservative, salicylic acid.

Lab. No. 321.
Brand, Tanto Pure Extract of Malt and Hops.
Producer or jobber, Barrett & Barrett, St. Paul.
Retailer, H. H. Seelig, Leonard, N. D.
Preservative, salicylic acid.

Lab. No. 815.
Brand, Crab Apple Cider.
Retailer, Park, Grant & Morris, Fargo.
Contains sulphites.

Lab. No. 879.
Brand, Cherry Cider.
Producer or jobber, New England Bottling Co., Minneapolis.
Contains coal tar dye.

Lab. No. 880.
Brand, Orange Cider.
Producer or jobber, New England Bottling Co., Minneapolis.
Contains coal tar dye.

Lab. No. 881.
Brand, Raspberry Cider.
Producer or jobber, New England Bottling Co., Minneapolis.
Contains coal tar dye.

Lab. No. 924.
Brand, Old Blackberry Brandy.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Colored with coal tar dye.

Lab. No. 939.
Brand, Peach Cider, Pure California.
Producer or jobber, Los Angeles Fruit Cider Co., Los Angeles, Cal.
Retailer, H. G. Sprague, Grafton, N. D.
Colored with coal tar dye and an imitation product.

Lab. No. 979.
Brand, Cherry Cider, Pure California.
Producer or jobber, Los Angeles Fruit Cider Co., Los Angeles, Cal.
Colored with coal tar dye, an artificial product, and contains benzoic acid.

MAPLE SYRUPS, SUGARS AND MOLASSES.

Lab. No. 223.
Brand, Beauce County, Quebec.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Cane sugar, 63.5 per cent; total solids, 70.98 per cent; ash, .086 per cent.

Lab. No. 225.
Brand, Uncle Josh.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Cane sugar, 65.7 per cent; total solids, 73.57 per cent; ash, .164 per cent.

Lab. No. 419.
Brand, Home Sap.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Retailer, Pure Food Depot, Fargo.
Glucose, 19 per cent; total solids, 60.14 per cent; ash, .68 per cent.

Lab. No. 575
Brand, Maple.
Producer or jobber, Leach, Gamble, Dexter & Co., Wahpeton, N. D.
Sucrose, 64.28 per cent; total solids, 70.65 per cent; ash, .178 per cent.

Lab. No. 604.
Brand, West Mooreland.
Producer or jobber, D. B. Scully Syrup Co., Chicago.
Retailer, Park, Grant & Morris, Fargo.
Sucrose, 61.42 per cent; solids, 68.49 per cent; ash, .18 per cent.

Lab. No. 605.
Brand, Fort Snelling.
Producer or jobber, Foley Bros. & Kelly, St. Paul.
Sucrose, 64.47 per cent; solids, 72.42 per cent; ash, .09 per cent.

Lab. No. 607.
Brand, Vermont.
Producer or jobber, Maneirro Yoe Syrup Co.
Retailer, box car merchant.
Cane sugar, 40 to 50 per cent; ash, .42 per cent.

Lab. No. 632.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, H. G. Sprague, Grafton, N. D.
One-third to one-half cane sugar; solids, 68.10 per cent; ash, 24 per cent.

Lab. No. 723.
Brand, Canada Maple.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, A. D. Sprague, Devils Lake, N. D.
Seventy-five per cent of added syrup; solids, 66.86 per cent; ash, .10 per cent.

Lab. No. 724.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, A. D. Sprague, Devils Lake, N. D.
Fifty per cent added cane sugar; solids, 65.04 per cent; ash, .19 per cent.

Lab. No. 757.
Brand, Pure Sap.
Producer or jobber, R. M. Dickinson, Cambridge, Vt.
Retailer, Leach, Gamble, Dexter & Co., Wahpeton.
Sucrose, 57.38 per cent; solids, 67.08 per cent; ash, .30 per cent.

Lab. No. 758.
Brand, Eastern Star.
Producer or jobber, made in Northumberland, Pa.
Retailer, Leach, Gamble, Dexter & Co., Wahpeton.
Sucrose, 61.94 per cent; solids, 70.55 per cent; ash, .14 per cent.

Lab. No. 759.
Brand, Canada Sap.
Producer or jobber, St. Paul Refining Co., St. Paul.
Retailer, Fargo Grocery Co., Fargo.
Sucrose, 72.59 per cent; solids, 72.59 per cent; ash, .10 per cent.

Lab. No. 839.
Brand, No. 1.
Producer or jobber, Maneirro Yoe Syrup Co., Chicago.
Retailer, Edwards Brothers, Fargo.
Solids, 70.18 per cent; ash, .18 per cent.

Lab. No. 840.
Brand, Maple.
Producer or jobber, Maneirro Yoe Syrup Co., Chicago.
Retailer, Edwards Brothers, Fargo.
Solids, 71.91 per cent; ash, .095 per cent.

Lab. No. 850.
Brand, Old Moose.
Producer or jobber, Arcadian Maple Co., St. Francios, Canada.
Retailer, Cramer Brothers, Lisbon, N. D.
Sucrose, 60.75 per cent; solids, 70.74 per cent; ash, .18 per cent.

Lab. No. 892.
Brand, Iowa Sorghum.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchants.
Glucose, 40.30 per cent; solids, 79.10 per cent; ash, 1.75 per cent.

Lab. No. 898.
Brand, Raspberry Syrup.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Contains coal tar dye, is an artificial syrup, colored and flavored with ethers.

Lab. No. 903.
Brand, Pure Maple.
Producer or jobber, W. W. Bardwell, Minneapolis.
Sucrose, 39.03 per cent; ash, .137 per cent.

Lab. No. 914.
Brand, New Orleans Molasses, Home Brand.
Producer or jobber, Griggs, Cooper & Co., St. Paul.
Retailer, Craigne & Gibbs, Minnewaukan.
Glucose, 19.50 per cent; sucrose, 17.06 per cent.

Lab. No. 915.
Brand, Pelican Bulk New Orleans Molasses.
Producer or jobber, National Molasses Co., St. Louis, Mo.
Retailer, Craigne & Gibbs, Minnewaukan.
Glucose, 51.53 per cent; sucrose, 24.92 per cent.

Lab. No. 930.
Brand, Maple.
Producer or jobber, St. Paul Refining Co., St. Paul.
Retailer, Rodenberg & Schwobel, New Rockford.
Sucrose, 62.57 per cent; solids, 69.93 per cent; ash, .45 per cent.

Lab. No. 931.
Brand, Puritan.
Producer or jobber, D. B. Scully & Co., Chicago.
Retailer, Pinkerton-Kellog Co. Lakota, N. D.
Sucrose, 61.49 per cent; solids, 73.61 per cent; ash, .13 per cent.

Lab. No. 932.
Brand, Northern Woods.
Producer or jobber, Berry-Maybrun Co., Chicago.
Sucrose, 42.80 per cent; ash, .081 per cent.

Lab. No. 933.
Brand, Raspberry Syrup.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Colored with coal tar dye.

Lab. No. 934.
Brand, Molasses No. 2.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Sucrose, 21.17 per cent; glucose, 16.16 per cent.

Lab. No. 936.
Brand, Climax Drips.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Colored with coal tar dye.

Lab. No. 954.
Brand, Iowa Sorghum.
Producer or jobber, John Sexton & Co., Chicago.
Retailer, box car merchant.
Sucrose, 18.49 per cent; glucose. 41.77 per cent.

Lab. No. 966.
Brand, Pride of Ohio.
Producer or jobber, C. A. Cram, Warren, Ohio.
Sucrose, 57.11 per cent; solids, 62.10 per cent; ash, .46 per cent.

Lab. No. 967.
Brand, Maple.
Producer or jobber, C. A. Cram, Warren, Ohio.
Sucrose, 60.15 per cent; solids, 68.51 per cent; ash, .52 per cent.

Lab. No. 1019.
Brand, Log Cabin.
Producer or jobber, Towle Syrup Co., St. Paul, Minn.
Retailer, Geo. Gussner, Bismarck.
Sucrose, 67.76 per cent.

Lab. No. 1044.
Brand, Towle's Log Cabin.
Producer or jobber, Towle Maple Syrup Co., St. Paul.
Retailer, Fargo Mercantile Co., Fargo.
Sucrose, 67.31 per cent; ash, .215 per cent.

Lab. No. 1099.
Brand, Monarch.
Producer or jobber, Reid, Murdock & Co., Chicago.
Retailer, Anderson & Nelson, Park River, N. D.

CANNED AND POTTED MEATS.

A number of samples of canned and potted meats as put up by Libby, McNeal & Libby, Chicago, were submitted for analysis by Burdick & Lincoln, of Fargo. In each case the gross weights were taken, which included the can also, net weights of actual contents and in each sample was determined the water, ash, fat and proteids. In a few instances it will be noticed the undetermined matter appears to be unusually large. In most instances this is due to added products, spices, sweetening material and bread crumbs or cracker dust. The full data is shown in the following table:

	Gross Weight —Grams	Net Weight —Grams	Water—Per Cent	Ash—Per Cent	Fat—Per Cent	Proteid—Per Cent	Undetermin'd —Per Cent
Prime roast beef	519	386	60.90	4.08	13.27	21.75	.....
Hamburg loaf	329	227	60.53	2.39	13.93	19.75	3.40
Chipped dried beef	251.5	149.5	47.34	9.37	4.73	30.81	7.75
Jellied hocks	574	422.5	61.94	2.44	16.31	18.75	.59
Ox tongue	926	738	61.08	4.03	11.92	23.81	.....
Potted chicken	290	210	59.81	2.76	16.08	15.68	5.67
Potted ham	287	210	64.30	3.31	15.15	16.75	.49
Ham loaf	337	227	58.43	3.43	14.50	18.94	4.70
Corned beef	422.5	339.5	58.83	2.33	15.90	22.38	.56
Chicken loaf	320	210	59.16	2.30	15.67	17.06	5.41
Dried beef	279	166	46.85	10.63	4.79	30.81	6.92
Whole pigs feet	362	272	64.84	3.59	11.94	19.81	.....
Chili con carne	283	206	66.52	2.66	9.61	16.75	4.46
Beef loaf	350	226	61.70	2.60	13.48	18.43	3.79
Veal loaf	.....	.....	41.47	2.72	19.02	14.56	22.23
Vienna sausage	295.5	214.5	68.02	4.00	10.11	14.18	2.09
Hamburg steak	310	209.9	62.26	2.46	14.70	17.00	3.58
Cooked lich tongue	309	218	59.54	3.41	14.19	22.06	.80
Potted turkey	289	210	60.98	2.70	16.54	16.75	3.03
Boneless chicken	279.5	197.5	64.58	4.89	3.14	28.63	.....
Chicken tamale	305	228	68.81	1.31	10.54	8.75	4.59
Boneless turkey	281.5	196.5	65.19	1.30	3.61	26.94	2.96
Roast chicken	562	438	70.69	1.83	3.77	24.63	.....
Corned beef hash	286	205.3	68.90	2.55	6.46	13.13	8.86
Melrose pate	323	211.5	65.36	5.10	11.32	15.07	3.16

ANALYSES OF SPICES.

During the summer we requested one of the manufacturers of spices to furnish us with samples of unground commercial spices, also with spices produced from like samples ground and ready for the market. Below we give the analyses for these samples, believing that they will prove helpful to others who may have to deal with the commercial spices as found upon the market:

Name	Water	Ash	Fat		Crude fibre	Proteid N x 6.25	Nitrogen—Free Extract	Water Extract	Alcohol Extract
			Volatile	Fixed					
Cinnamon	7.41	3.34	2.48	1.69	22.65	3.70	58.73	.....	.....
Allspice	6.76	4.49	.....	7.46	20.47	4.88	55.94	.....	.....
Cloves	12.39	8.53	10.49	8.30	12.68	6.75	40.86	.....	.....
Black pepper	6.63	5.62	.....	8.18	12.26	12.06	55.25	.....	.....
Mace	2.81	2.70	5.59	21.62	2.42	10.31	54.35	.....	17.75
Cayenne pepper	7.97	5.41	2.06	20.30	20.41	14.87	28.98	17.06	22.61
Ginger	4.70	5.26	5.04	13.24	4.16	9.84	57.76	14.10	6.55
Nutmeg	8.65	2.28	1.76	21.76	7.12	9.15	49.28	.....	11.57
Cloves	14.58	6.80	8.26	16.83	10.23	6.47	47.83	.....	22.36
Cinnamon	7.75	3.21	2.78	2.27	16.90	3.66	63.43	.....	28.29
White pepper	9.52	1.23	1.50	6.87	3.69	12.56	64.63	.....	8.02
Mustard	5.62	5.55	0.87	15.68	5.50	39.34	27.44	37.22	23.06
Black pepper	9.47	3.97	1.99	8.04	12.40	14.68	49 45	.....	9.45
Allspice	9.01	4.53	5.65	6.20	24.72	7.06	42.85	.....	14.35

In addition to the above the manufacturers furnished me with a series of mixtures not infrequently used as adulterants for spices.

The bases for these mixtures were in most cases cereals so colored as to imitate very closely the pure spices themselves. In fact, in some instances the mixtures would readily be mistaken for the spices as one would see them in glasses, but of course they were void of any of the characteristic flavor or odors of the real spices. Below I give the analyses of this series of mixtures:

Mixture	Water	Ash	Fat		Crude Fiber	Proteid N x6.25	Nitrogen-Free Ext'ct	Water Extract	Alcohol Extract
			Volatile	Fixed					
Cayenne	10.12	4.68	0.58	8.34	2.08	13.93	42.27	13.33	8 80
White pepper	9.00	1.95	0.15	3.28	1.08	16.78	67.76	.....	6.17
Black pepper	8.52	3.05	0.10	1.65	53.32	3.40	29.96	.....	2.19
Mace	5.69	3.25	1.69	6.26	0.81	13.31	68.99	.....	6.51
Allspice	6.09	4.47	1.19	8.38	20.43	16.25	43.19	.....	11.58
Nutmeg	8.97	2.69	0.39	7.08	12.64	10.38	57.85	.....	9.22
Cinnamon	7.20	3.05	0.54	0.86	24.12	7.50	56.83	.....	2.58
Cloves	6.19	7.91	0.64	7.97	21.78	14.56	40.95	.....	10.47
Ginger	9.27	3.28	0.58	2.85	1.58	17.25	65.19	22.42	5.78

ANALYSES OF TEAS.

A few samples of the commercial teas as found upon the market have been analyzed. In the table following Nos. 1 to 4 inclusive were commercial blends, while No. 5 is what is known as poppy tea. Below are given the results for these analyses:

	No. 1	No. 2	No. 3	No. 4	Poppy Tea No. 5
Water	3.13	2.34	4.02	6.13	5.49
Ash	5.80	6.19	6.41	6.45	5.73
Fat	11.28	6.34	6.09	6.33	4.94
Proteids	26.37	23.25	24.87	24.12	25.18
Crude fibre	10.63	11 12	9.66	10.48	8.69
Nitrogen free extract	42.79	50.76	48.95	46.49	49.57
	100.00	100.00	100.00	100.00	100.00
Nitrogen	4.22	3.72	3.98	3.86	4.09
Water soluble ash	2.33	3.39	3.56	3.63	3.94
Water extract	46.35	.....	46.90	.....	.....

COURT CASES FROM JULY 1, 1903 TO JANUARY 1, 1904.

There have been but few cases of prosecutions since the law took effect July 1, 1903. Prosecutions have been begun against retailers only in those cases where it was evident the manufacturer or jobber was not taking steps to comply with the law. In the cases against I. N. Clark, representing George Meldrum (box car merchant), Chicago, for selling spirit vinegars as cider vinegars, a conviction was secured in the justice court, but an appeal was taken to the district court and the case is still pending.

In the case against the same party for selling adulterated maple sugar, a conviction was secured in the justice court, but the defendant appealed to the district court and the case is still pending, having been set for the January term of court.

In the case against A. P. Lewis, representing Pfohl & Smith, for selling candy adulterated, a conviction was had before Justice Geary at Fargo, but the defendant appealed the case to the district court and the case is still pending.

CASE 1.

State vs. S. P. Leslieyoung.
Charged with selling artificial strawberry extract colored with coal tar dye.
Justice court, Valley City.
Fined $25 and costs.

CASE 2.

State vs. S. P. Leslieyoung.
Charged with selling adulterated imitation strawberry jelly colored with coal tar dye and chemically preserved.
Justice court, Valley City.
Fined $25 and costs.

CASE 3.

State vs. I. N. Clark.
Charged with selling spirit vinegar for cider vinegar.
Justice court, Grand Forks.
Fined $100.
Appealed to district court.

CASE 4.

State vs. I. N. Clark.
Charged with selling maple sugar adulterated and not properly labeled.
Justice court, Grand Forks.
Fined $100.
Case appealed to the district court.

CASE 5.

State vs. L. Stern.
Charged with selling cherries colored with coal tar dye.
Justice court, Grand Forks.
Fined $25 and costs.

CASE 6.

State vs. L. A. Brooks.
Charged with selling adulterated tomato catsup.
Justice court, Grand Forks.
Fined $25 and costs.

CASE 7.

State vs. S. P. Leslieyoung.
Charged with selling Jamaica ginger colored with coal tar dye.
Justice court, McHenry, November 4, 1903, before Archy Lamont.
Fined $25.

CASE 8.

State vs. Geo. H. Fannon.
Charged with selling adulterated raspberry syrup containing coal tar dye.
Justice court, Grafton, October 31, 1903, H. A. Ball.
Fined $75 and costs.

CASE 9.

State vs. Geo. H. Fannon.
Charged with selling raspberry syrup adulterated with coal tar dye.
Justice court, Lakota, H. D. Fent.
Fined $50 and costs, $27; total, $77.

CASE 10.

State vs. R. B. Griffith.
Charged with selling adulterated canned strawberries.
Justice court, Grand Forks.
Fined $25 and costs.

CASE 11.

State vs. G. H. Wilder.
Charged with selling French cherries adulterated with coal tar dye.
Justice court, Grand Forks.
Fined $25 and costs.

CASE 12.

State vs. M. Colton.
Charged with selling tomato catsup adulterated with coal tar dye.
Justice court, Grand Forks.
Fined $25 and costs.

CASE 13.

State vs. W. F. Perry.
Charged with selling an artificial adulterated beverage colored with coal tar dye.
Justice court, Grand Forks.
Case continued.

CASE 14.

State vs. A. P. Lewis.
Charged with selling adulterated candy containing coal tar dye.
Justice court, Fargo.
Fined $25 and costs.
Appealed the case to the district court.

PURE FOOD LAW.

An Act to Prevent the Adulteration, Misbranding and Selling of Adulterated and Unwholesome Foods and Beverages, Prescribing a Penalty for the Violation Hereof, Providing for the Inspection and Analysis of Foods, Charging the North Dakota Experimental Station with the Duty Thereof, Charging the State's Attorney with the Enforcement Hereof and Making an Appropriation Therefor.

Be It Enacted, etc.

SECTION 1. ADULTERATING AND MISBRANDING FOODS AND BEVERAGES.—It shall be unlawful for any person, his agent or servant, or while acting as agent or servant of any other person or corporation, to manufacture for sale or offer for sale any article of food or beverage which is unwholesome or adulterated within the meaning of this act.

SEC. 2. WHAT CONSTITUTES ADULTERATION. Any article of food or beverage shall be considered as unwholesome or adulterated within the meaning of this act:

First. If it contains any form of aniline dye or other coal tar dye.

Second. If it contains formaldehyde, benzoic acid, sulphites, sulphurous acid or salicylic acid.

Third. If any substance or substances have been mixed with it so as to reduce or lower or injuriously affect its quality or strength, so that such article of food or beverage when offered for sale, shall deceive or tend to deceive the purchaser.

Fourth. If any inferior or cheaper substance or substances have been substituted wholly or in part for the article, so that the product when sold shall deceive or tend to deceive the purchaser.

Fifth. If any necessary or valuable constituent of the article has been in whole or in part abstracted.

Sixth. If it be an imitation of or offered for sale under the specific name of another article.

Seventh. If it be labeled or branded so as to deceive or mislead the purchaser.

Eighth. If it consists wholly or in part of a diseased, decomposed, filthy or putrid animal or vegetable substance.

PROVIDED, That an article of food or beverage shall not be deemed adulterated in the following cases:

First. If it be a compound or mixture of recognized food products and not included in definition sixth of this section.

Second. In the cases of candies and chocolates if they contain no terra alba, barytes, talc, chrome yellow or other mineral substances, or aniline dyes or other poisonous colors or flavors detrimental to health.

Third. If in the case of baking powders or any mixture or compound intended for use as a baking powder they have affixed to each and every box, can or package containing such powder or like mixture or compound, a light colored label upon the outside and on the fact of which there is distinctly printed with black ink and in clear, legible type the name and address of the manufacturers, the true and correct analysis, and in a form to be prescribed by the North Dakota Government Agricultural Experiment Station, of each and all the constituents or ingredients contained in or contributing a part of such baking powders, or mixture or compound intended for use as a baking powder.

SEC. 3. PENALTY FOR SO DOING. Any person violating any of the provisions of this act shall be deemed guilty of a misdemeanor, and shall for the first offense be punished by a fine of not less than twenty-five dollars or more than one hundred dollars, and all necessary costs, including the expense of analyzing such adulterated articles when said person has been found guilty under this act.

SEC. 4. DUTY OF STATE'S ATTORNEY. It shall be the duty of the state's attorney to prosecute all persons violating any of the provisions of this act when the evidence thereof has been presented by the North Dakota Government Agricultural Experiment Station as provided for in sections 7 and 8 of this act.

SEC. 5. THE NORTH DAKOTA EXPERIMENT STATION TO INSPECT AND ANALYZE FOODS AND BEVERAGES. The North Dakota Government Agricultural Experiment Station shall make analysis of food products and beverages on sale in North Dakota suspected of being adulterated, at such times and places and to such extent as it may determine, and may appoint such agent or agents as it may deem necessary, and the sheriffs of the respective counties of the state are hereby appointed and constituted agents for the enforcement of this act, and such agent or agents and sheriffs shall have free access, at all reasonable hours, for the purpose of examining into any place wherein it is suspected any article of food or beverage adulterated with any deleterious or foreign ingredient or ingredients exists, and such agent, agents or sheriffs upon tendering the market price of said article may take from any person, firm or corporation samples of any articles suspected of being adulterated as aforesaid, and the said Station may adopt or fix standards of purity, quality or strength when such standards are not specified or fixed by statute.

SEC. 6. CITIZEN MAY SEND SAMPLE OF FOOD OR BEVERAGE FOR ANALYSIS. Any citizen of the state may, by prepaying the transportation charges, send any article of manufactured food or food product, or beverage, in the original package, to said Station to be analyzed. And such article if not before analyzed shall be analyzed and included in the next report of the Station as provided for in section 9 of this act.

SEC. 7. FACTS, HOW TRANSMITTED. Whenever said Station shall find by its analysis that adulterated food products have been

on sale in this state, it shall forthwith transmit the facts so found to the state's attorney of the county in which said adulterated food product was found.

SEC. 8. CERTIFICATES AS EVIDENCE. Every certificate duly signed and acknowledged by the chemist of the North Dakota Government Agricultural Experiment Station at Fargo relating to the analysis of any food, food products or beverages shall be presumptive evidence of the facts therein stated.

SEC. 9. STATION TO MAKE ANNUAL REPORT. The said station shall make an annual report to the governor upon adulterated food products, and said report may be included in the report which the said station is already authorized by law to make to the governor, and in June and December of each year the said station shall furnish to the auditor of each county in the state a certified list of all adulterated foods, food products and beverages as found by such analysis, showing the name and brand of the article, the manufacturer, and the name of the injurious adulterant. The county auditor of each county shall cause the said list to be published in the official paper of such county. Said publication shall be made in July and January of each year and shall continue for two successive issues to be paid for by such county at the rate allowed by law for publishing the proceedings of the board of county commissioners.

SEC. 10. DUTY OF SHERIFF ON PRESENTATION OF COMPLAINT OF VIOLATION OF THIS ACT. COMPENSATION. It is hereby made the duty of the sheriff of any county of this state, on presentation to him of a verified complaint of the violation of any provision of this act, to at once proceed to obtain by purchase a sample of the adulterated food, food product or beverage complained of, and forward the same to the said Station for analysis, marking the package or wrapper containing the same for identification with the name of the person from whom procured, the date on which the same was procured, and the substance therein contained. For his services hereunder the said sheriff shall be allowed the same fees for travel as are now allowed by law to sheriffs on service of criminal process, together with such compensation as may be by the county commissioners of his county deemed reasonable, and all amounts expended by him in procuring and transmitting the said samples, which fees and amount expended shall be audited and allowed by the said commissioners and paid by his said county as other bills of said sheriff.

SEC. 11. APPROPRIATION. To carry out the provisions of this act, out of any money in the state treasury, not otherwise appropriated, the sum of fifteen hundred dollars is hereby annually appropriated to the said North Dakota Government Agricultural Experiment Station, which sum shall be paid in equal quarterly installments to the treasurer of the board of trustees of said station, upon the order of the state auditor, who is hereby directed to draw his order for the same.

SEC. 12. NO ACTION IN COURT. No action shall be maintained in any court in this state on account of any sale or other contract made in violation of this act.

SEC. 13. REPEAL. All acts and parts of acts inconsistent with the provisions of this act are hereby repealed.

Approved March 2, 1903.

HINTS FOR THOSE WHO WOULD COMPLY WITH THE PURE FOOD LAW.

The Lewis pure food law went into effect July 1, 1903, and it became the duty of the Government Agricultural Experiment Station at Fargo, North Dakota, to examine all food products offered for sale in the state, and when found to be adulterated to cause the offending party to be prosecuted for violation of the law.

By vote of the board of trustees of the Agricultural College, the chemist of the Experiment Station (E. F. Ladd) became the food commissioner for North Dakota on July 1, 1903, charged with the duty of enforcing the law in so far as it is made a part of the duty of the Station.

Retail grocers and all merchants dealing in food products, in making contracts for a new supply of goods, should specify that the same shall comply with the requirements of the Lewis pure food law. Some of the conditions of this law are as follows:

1. The foods or beverages must not contain prohibited chemical preservatives.
2. They must not contain coal tar or aniline dyes.
3. They must be labeled true to name.
4. If any essential constituent has been removed, the substance is adulterated.
5. If any substance has been added, so as to deceive or mislead the purchaser, the product is adulterated.
6. Mixed or compounded substances may be sold when properly labeled.
7. Vinegars must be sold under true names. Cider vinegar must be made wholly from apples.
8. The sheriffs in each county are deputies for guarding against the sale of adulterated food products in each county.
9. The Station is authorized to fix standards of purity, quality or strength.
10. Any citizen may have foods analyzed at the Experiment Station.
11. Twice each year county auditors must publish in the official paper a list of all adulterated foods found on sale in the state.
12. If adulterated goods are sold, no action can be maintained in any court in the state for the purpose of collecting outstanding bills for the same.

13. The state's attorney must prosecute all persons violating the law when evidence has been furnished by the Station.

14. Coffees must be pure, free from chicory, unglazed, not polished, and not extracted.

15. Extracts must be pure and what they claim to be.

16. Candies must not contain coal tar dye or harmful products.

17. Meats must not be colored or contain preservatives.

18. Sausages must not contain tainted or decomposed meats, and must not contain prohibited preservatives or coal tar dye.

19. The food commissioner, his agents, the sheriffs or their deputies shall have free access; at all reasonable hours, for the inspection of foods.

RULINGS.

The following rulings are those required under the state law, and are now generally accepted in other states:

BAKING POWDERS.

All baking powders to be sold in the state must be labeled in a conspicuous way and place with a name signifying the class or variety to which it belongs based on the name of the acid ingredient, and in form acceptable to the Experiment Station.

The following will be aceptable for the several forms: "This baking powder contains the following ingredients and none other." Then shall follow an enumeration of the constituents plainly expressed in the clearest and simplest terms. Acid sulphites are prohibited from use in any food product.

Buckwheat Flour.—Buckwheat flour must be the pure flour made from buckwheat. If it have other flour or self-raising ingredients mixed with it not injurious to health, it may be sold as "compounded buckwheat flour."

Candy.—Candy must be free from inert mineral matter. It must contain no terra alba, barytes, talc, chrome yellow or other mineral substance or aniline (coal tar dyes) or other poisonous colors or flavors detrimental to health.

Canned Goods.—Canned goods of all kinds must be free from coal tar dye or other harmful coloring matters. They must contain no formaldehyde, salicylic acid, benzoic acid, sulphurous acid or sulphites. If they contain other preservatives, the name of the preservative must be clearly indicated on a label.

Soaked Goods.—All soaked or bleached goods put up from products dried before canning shall be plainly marked, branded, stamped or labeled on each can or container with the words "soaked" or "bleached goods" in letters clear and distinct, in size not less than two line pica.

Chocolates and Cocoa.—Chocolate and cocoa, if made from the cocoa mass, sugar and glycerine, may be sold under the name "prepared cocoa" or "sweet chocolate." No other products can be sold under these names.

Coffee.—Coffee must be true to name. It must not be coated or polished to conceal inferiority. It must contain the extractive volatile matter natural to coffee. Compounds of coffee and chicory, or of coffee and other harmless substitutes allied to it in flavor and strength, and when not added as an adulterant, may be sold when properly labeled "coffee compounded." Imitations containing coffee cannot be sold as coffee compounds. They may be sold under coined names not intended to deceive.

Cream Tartar.—This compound must be pure. No compound may be lawfully sold as cream tartar.

Saccharin, or the so-called coal tar sugar, under whatever name used or sold, must not be used in any article of food or beverage offered for sale in North Dakota after July 1, 1904. This ruling will be enforced, and all goods found to contain the same will be declared illegal and in violation of the law.

EXTRACTS.

Artificial Extracts may be sold when labeled "artificial extracts," but, when the same natural extract is made from the fruit itself, an imitation product can be sold under the name of the fruit extract.

Lemon Extracts shall contain not less than 5 per cent of the pure oil of lemon dissolved in ethyl alcohol, and be free from any foreign color.

Vanilla Extract shall be made wholly from vanilla beans, and shall be free from any artificial coloring matter. Coloring matter added here must be deemed used for the purpose of concealing inferiority so as to deceive the purchaser.

When other flavoring substances are used, such as vanillin, coumarin or tonka, the extract should be labeled so as to show the purchaser its true character and not to deceive. The term "compounded extract of vanilla" is not a proper labeling.

The use of coloring matter of any kind is prohibited in this class of extracts.

JELLIES, SYRUPS, ETC.

Fruits, Jellies, Jams, Preserves, Etc.—These must be free from coal tar dyes, and must not be colored and labeled to imitate some other product so as to deceive the purchaser. They must be free from formaldehyde, salicylic acid, benzoic acid, sulphurous acid, sulphites or other harmful preservatives. If any preservative not prohibited is used, the name of the preservative must be plainly shown on a distinct label on each and every package.

Every Artificial Product made in part or in whole of glucose, dextrine, starch or other substances not injurious to health may be distinctly labeled "imitation fruit, jelly, jam or butter," but must not contain the name of any fruit so as to deceive or mislead the purchaser.

Honey.—Honey adulterated with glucose or other substances may be sold when labeled "adulterated honey."

Lard.—Imitation lard products must not be sold under the name of lard. "Compound lard" may be used on compounds made of lard and other substances.

Maple Sugar.—Maple sugar must be true to name. If added cane sugar is present, each and every package must be clearly and distinctly labeled so as to show its true composition.

Syrups.—Maple syrups must be the product produced from the sap of the maple tree.

Artificial Products intended to imitate maple syrups must not be sold under that name.

Molasses having mixed with it glucose may be sold as syrup, but in no case as molasses or molasses compound.

Glucose may be sold when labeled as glucose, corn syrup or under such coin name as not to deceive the purchaser. The product must be free from all sulphites and other bleaching agents.

MEATS, ETC.

Meats.—Meats of all kinds must not contain prohibited preservatives or coal tar dyes.

Sausage.—Sausages must be free from tainted or decomposed meat, must not contain coal tar dye or prohibited chemical preservatives.

Canned Fish and Meats must be free from chemical preservatives, and all fish products must be labeled true to name.

SPICES AND CONDIMENTS.

All spices must be pure. The mixture of foreign substances with any spice is adulteration. The extracting of the active principle of any spice, as extracting or removing the oil of cloves or the active principal of ginger, is an adulteration.

A Mixed or Imitation product must not be labeled so as to mislead or deceive the purchaser. The word "compounded" before or after the name of the spice is not a proper labeling for imitation or adulterated goods.

Vinegars.—All vinegar must contain at least 4 per cent of absolute acetic acid carrying in solution, if undistilled, extractives from the fruit, grain, vegetable or syrup used in their preparation. The term "vinegar" is limited to water solution of acetic acid derived from alcohol by fermentation.

Cider Vinegar must be made wholly from the fermented juice of the apple. Artificial or other vinegars fortified with another must not be sold as cider vinegar. The addition of apple pomace or apple jelly to the vinegar does not entitle it to be sold as cider vinegar.

Malt Vinegars must be made entirely from an infusion of malted grains. Every jug or retainer should be labeled with the class of vinegar contained therein.

The coloring of distilled and malt vinegars is in direct violation of section 2 of the food law, and when such vinegars are found to be so colored they will be classed as illegal and the retailers are liable to prosecution.

Whenever the words "artificial," "compounded," or "imitation," etc., are used, these words must be printed immediately preceding or following the word they are intended to modify, in the same type and equally prominent.

Tomato Catsup must be made from ripe tomatoes, uncolored and free from any foreign filler like starch or vegetable product.

STATEMENT

OF RECEIPTS AND EXPENDITURES FROM JULY 1, 1902 TO JULY 1, 1903.

RECEIPTS.

Received from U. S. Hatch Act March 2, 1887	$15,000

DISBURSEMENTS.

By salaries	$7,741.85	
Labor	3,056.31	
Publications	769.88	
Postage and stationery	376.25	
Freight and express	150.47	
Heat, light, water and power	777.46	
Chemical supplies	59.68	
Seeds, plants and sundry supplies	325.60	
Feeding stuffs	486.60	
Library	3.72	
Tools, implements and machinery	100.96	
Furniture and fixtures	50.12	
Scientific apparatus	375.72	
Live stock	440.00	
Traveling expenses	132.50	
Contingent expenses	66.75	
Buildings and repairs	86.13	
Total		$15,000

C. E. NUGENT,
Secretary.

BULLETIN No. 59

Trees and Fruit in North Dakota

BY C. B. WALDRON

TREES AND FRUIT IN NORTH DAKOTA.

The day of exploitation in North Dakota is rapidly passing and that of home building has taken its place. It is probable that no equal population has a larger proportion of home owners than has North Dakota. This fact, coupled with the important one that there is greater wealth per capita in North Dakota than in any other state, gives such conditions as should make possible a class of homes characterized by their comfort and attractiveness.

Since the earliest days of man trees have been considered a natural and fitting adornment and shelter for his home. In forests primitive man found his first shelter and protection. Trees were his necessity then, and the race can never rid itself of the instincts developed through the long ages of its evolution. We may admire the great expanse of prairie stretching away to the horizon, as we do the boundless ocean, but that does not imply that it includes the conditions making the most desirable homes. With the home are naturally associated the ideas of individuality, of snugness and, to a certain extent, seclusion, none of which can be attained if the place seems a part of the public domain.

In a region, too, like that of North Dakota, where the winds have fairly earned a reputation for strength and persistence, trees have a use as well as beauty. Passing from the shelter of the forest to open country on a cold, windy day one is made aware of all the difference between comfort and misery.

These facts are admitted by everyone, even by those that can offer no excuse for the bare dreariness and desolation that characterize the places where their lives are spent. To spend a lifetime without the presence of a single natural object about which the affections and memories can center, should not be an alluring prospect to

Attractive homes constitute an active and potent force in shaping civilized man. To busy men with their great amount of necessary work to be done these things are often overlooked, but for all that their importance is not less real.
and determining the character of society and its members, and after all there is nothing important but that.

There are certain elements in people that are accepted as evidences of civilization. These are established for the most part during the period of childhood and youth. Nothing on earth can take the place of a high state of civilization, and they make but a poor bargain who sacrifice the possibility of it for wealth or acres.

To rear a generation amid surroundings that because of their dreariness and monotony depress and stultify the mind and imagination instead of quickening and enlivening it, is neither wise nor patriotic. It is not enough to say that we don't intend to do so. It is our duty and privilege to see that we do not. The individual experiences of the most of us bear testimony to the fact that no memories are more vivid or fondly cherished than those of the trees that once offered us protection and company. We feel somehow that their influence was good. Until human nature becomes something different than it is they will continue to exercise a most potent influence on the character of man.

Nations live or die with their forests, as the records of the world testify. Forests are the one great conserving element in nature. The winds and waters are constantly wasting and wearing away the fertile elements of the soil and hurrying them on to the sea, beyond the reach of man forever. By this process, long continued, whole regions have been made desolate and barren beyond reasonable hope of redemption, and even within the memory of living man large areas have been rendered useless through the same causes.

Aside from the secondary value of forests in preventing the waste and destruction of cultivated areas, the time has come when the forests themselves have a high money value. It is possible to grow five cords of wood per acre each year for an indefinite period upon millions of acres of our lands. With the present high price of timber, and that constantly increasing, this prospect alone should be an inviting one to the far sighted man.

Trees are grown for three purposes, for shelter, for ornament and for their timber or fuel value. About forty species can be grown in North Dakota. Among these are the white ash, white elm, red elm, rock elm, box elder, soft maple, hard maple, Norway maple, basswood, burr oak, cottonwood, white poplar, walnut, Russian wild olive, hackberry, white willow, birch and mountain ash.

SIZE AND COST OF TREES.

For the planting of groves, shelter belts, etc., seedling trees from one and one-half to two feet high will be found the most satisfactory. They may be procured from any nursery at a cost of from $3 to $5 per 1,000. Trees that have been transplanted in the nursery cost much more, from $10 to $20 per 100, and are more difficult to transplant.

METHOD OF PLANTING.

In planting seedling trees we ordinarily plow a deep furrow by going down and back in the same place, thus throwing the soil out in both directions. A line is then stretched along the furrow about a foot from the bottom supported by stakes at convenient distances. For further convenience the line may run through holes

in the stakes and may be marked at intervals of four feet to give distance in planting.

As the trees are unpacked they should be partially buried in moist earth at different points along the place of planting to keep them in good condition and make them easily accessible to the planters.

Three men are required for planting, one to pass along the line holding the trees in position, while a man on either side shovels the earth about the roots. After this process is completed it is very essential to pass along the row and tread the earth very firmly about each tree.

TIME OF PLANTING.

The trees should be set as early in the spring as the soil can be handled. Trees should be ordered early if one wishes to get good quality, and to be sure of having his orders filled. They may be ordered shipped on any date. If they arrive before the ground is ready they should be unpacked and spread out in a cool, shady place where they may be covered with damp earth or straw, or they may be heeled in the earth out of doors, covering the tops with straw to prevent the buds starting.

CULTIVATION.

Trees demand a mellow, moist soil, such as is found in the forest. They will not make a satisfactory growth, if indeed they live at all, in a hard, dry soil, especially if it be allowed to grow to grass and weeds. For these reasons the soil must be kept constantly cultivated until such time as the trees by their own shade supply the conditions under which they will thrive.

The number of years that a grove will require cultivation depends upon the character of the soil, the kinds of trees employed and the distance apart in planting. Quick growing trees like the box elder planted in moist, mellow soil two by four feet apart and kept well cultivated will make forest cover in three years.

On the other hand trees giving but little shade like the cottonwood will never make a forest cover sufficient to keep out the grass and weeds, no matter how planted.

VARIETIES AND ARRANGEMENT IN PLANTING SHELTER BELTS.

Trees for this purpose should be easily and quickly grown, perfectly hardy and of dense, compact habit. All of these qualities may not be found in any one variety, but a selection of three or four kinds may be made to include all the necessary qualities.

A single row of trees, excepting the evergreens, is not sufficient to make a good windbreak. It is found that three or four rows are required to make a perfect shelter. To give height to the windbreak, and that as soon as possible, a single row of cottonwoods,

or preferably Carolina poplars, should be planted as the north row of a windbreak running east and west and the west row of one running north and south. As they will not endure crowding, they should not be planted closer than eight feet apart.

This same distance should be maintained between the rows. The two middle rows should be made up of trees having a compact, bushy growth like the silver maple and box elder. These will endure shade and may be planted four feet apart.

The maple is a little harder to start than the box elder, but makes a better tree for the purpose in time. The two sorts planted alternately make an excellent combination.

The inner row may be of any compact growing kind, like the golden Russian willow or Russian wild olive, planted two feet apart. On high, dry soils, where the silver maple is not a success, the green ash may be substituted. Some of the best shelter belts on the station grounds are made up of elm, white ash and soft maple for the inside rows, leaving out the box elder, which is apt to make a poor growth after the first few years, except on very deep, moist soil.

For the first few years the windbreak will need to be kept well cultivated. When the trees begin to reach across the spaces between the rows, a heavy mulch of old straw may be applied to the ground to take the place of cultivation. By the time that is gone the trees will have the weed question settled for good. Trees in a windbreak should not be trimmed, but allowed to branch freely, clear to the ground if they will. To encourage this the trees are planted further apart than they should be in a grove.

LOCATION OF THE WINDBREAK.

The location of the windbreak will depend upon the conditions surrounding each place. It is a mistake to plant too close to the buildings. Enclose a space large enough to include the garden and fruit plantation, as well as to give a spacious yard about the buildings for planting ornamental things.

Windbreaks should be so placed that the snow which accumulates on the south side in the winter will not cause inconvenience. If there is some difficulty in doing this, a single line of willows planted a few rows to the north of the shelter belt will catch the snow and prevent its drifting through. The space between this row and the windbreak may be used for strawberries and bush fruits which are benefited by a snow protection in winter. Apple and plum trees so located would be broken down by the snows. Where the shelter belt bounds the lot on which the house stands, either at the sides or rear or both, it may be greatly improved in appearance by planting more or less irregular masses of shrubbery against it. These break up the rather formal and harsh appearance of the straight lines of trees into something more artistic and effective.

Plate 1—White Ash, Twelve Years Old. North Dakota Experiment Station.

As the trees get large a place without shrubbery looks desolate and cheerless compared with the comforting and homelike appearance that shrubs give.

The shrubs suited for this purpose will be given in another part of the bulletin.

TREE PLANTING FOR GROVES.

The primary purpose in planting a grove is to establish a wood lot on which to draw for supplies of fuel and posts as they are needed on the farm. Incidentally it may be made a very attractive feature of the farm and also serve for shelter.

The increasing scarcity of timber for all purposes is making the timber question a very important one. Timber is being removed from the forest areas of the country today about twice as fast as the forests can renew it. This of course will lead to a condition when growing timber will become a necessity.

Already timber growing on a commercial scale has been entered upon in some parts of the country. It is doubtful if timber growing will ever be established as a great commercial enterprise in North Dakota. At the same time the value of a wood lot on each farm, if properly grown, will in most cases more than compensate for the time and money required to grow it.

The work at this station has not been extended enough to answer in a practical way all the questions that might be asked concerning timber culture. We can only call attention to the experiments we are making and to what we have seen in other groves, including the belts of native timber.

Among the trees that will succeed well in groves are the willow, white ash, green ash, American elm, rock elm, soft maple, box elder, basswood, birch and white poplar. They are all native trees but will not of course all succeed equally well in all parts of the state. The green ash is found wherever trees will grow at all, and the elm is also widely distributed. The soft maple and the basswood seem to require moist soils, such as are found along river bottoms.

It will be noticed that the cottonwood and balm of Gilead, both native trees and rapid growers, have been left out of the list of trees suited for groves. The balm of Gilead may possibly be used to some extent, but the cottonwood is not to be considered. Planted singly it does well and is a useful tree, but it demands too much light and gives too little shade to make it a possible forest tree. It is also a well known fact among tree growers that other trees will not thrive in the vicinity of cottonwoods.

DISTANCE APART FOR PLANTING.

Trees suited for groves ordinarily do not make a good growth when planted some distance apart unless they are of considerable size when planted. A seedling elm or ash left to itself tends to

grow in the form of a bush and makes little progress in height. For this reason seedling trees of the varieties named must be planted close enough together to shade each other at the sides. This will prevent the growth of lateral branches and compel an upright growth.

Trees in a grove to be of any value should be tall and straight. By being forced to stretch up to get the light they naturally become so.

Two feet between the trees in a row is about the right distance at first. The rows may be far enough apart to cultivate easily with a two-horse team, or about eight feet. The soil should be in such a shape that it may readily be cultivated. The method of planting has already been described.

Trees like the box elder, making a quick growth but being short lived, are used simply as nurse trees to get the others started. They shade the ground quickly, and in that way are a benefit to the other trees. The permanent trees are those like the elm, ash and basswood. Every other tree should be a nurse tree. Between these the permanent trees may be distributed as suits the fancy of the planter. The larger growing trees like the elm and white ash should not be nearer than eight feet apart in the row. The green ash makes a quicker growth than the white ash but does not continue it so long. It may be used as a semi-permanent tree planted half way between the larger kinds. Its timber is valuable for posts or fuel.

CULTIVATION.

While small the trees may be cultivated the same as corn with an ordinary two-horse cultivator. Another excellent tool for this purpose is the Acme harrow. This cuts about seven feet wide. It is a good weed destroyer, and leaves the soil well pulverized and in good shape to retain the moisture. With it one can cultivate an acre of trees an hour.

Until the trees begin to shade the ground they should be cultivated frequently, about once in ten days or two weeks and especially after every rain. In ordinary seasons the cultivation should continue until late in the fall, but in seasons of excessive rainfall the cultivation may stop late in the summer to give the wood a chance to ripen for winter.

In dry seasons cultivation is more imperative than in wet. As the trees become large enough to shade the ground, which they will do very quickly if well tended, less cultivation will be required, and after four or five years they will need but little. In most cases it can be done away with entirely, and a good mulch of old straw will meet all requirements.

PRUNING.

During the first and second years the trees will be benefited by cutting off the side branches to keep them from forking and to force an upward growth. After that they should shade each other enough so that side branches will not form. This work may be done in the spring or summer, not later than July, or in the late fall. Pruning late in the summer forces a late growth that will not mature before winter.

THINNING.

Left to themselves, no matter how thickly planted, the stronger trees gradually outtop the weaker ones and thus nature does her own thinning. On can save time, however, and get better results if this process is not left wholly to nature. When the trees show evidences of being crowded a part of them should be removed. These will naturally be the nurse trees that have served their purpose in getting the others started. If desired for planting elsewhere they may be dug out late in the fall and heeled in for winter in some spot where the snow will drift over them, or they may be dug out in the spring and planted at once when needed.

These trees being nursery grown should be tall and straight and well suited for street or lawn planting. They have a market value of about $10 per 100, an acre producing 1,360 trees where none are missing. This still leaves the trees standing four by eight feet apart, and in time these will need further thinning.

LIST OF TREES FOR TIMBER PLANTATION.

White Ash.—The wood of this tree is strong and durable. It is used where strength and elasticity are required, as in fork handles, whiffletrees, the manufacture of vehicles, farm machinery, etc. It it fairly durable when used as posts and has a high fuel value. The wood of the green ash has much the same qualities. Both of these trees are slow to leave out in the spring and shed their foliage early in the fall. For that reason they should be planted with other sorts not having this defect, in order to better prevent the growth of grass and weeds among the trees.

American Elm.—This is of little money value to the farmer except for fuel. The wood is not durable in contact with the soil. Its value is chiefly as a shade tree.

Basswood.—The timber of this tree has no special value except for fuel until such time as the trees are large enough to be made into lumber. It is then in demand where a light, stiff material is required, as in the manufacture of trunks, etc.

Silver Maple.—This is also known as white maple and soft maple. Its only timber use for the farmer is for fuel. It should not be planted singly, as it is easily broken by the winds. It is very ornamental and holds its foliage well. Its chief use is as a shelter and nurse tree.

White Willow.—This tree grows rapidly and makes a large amount of fuel in a few years. When well seasoned it makes a post that is fairly durable. Its hardiness and the ease with which it is started make it one of the most valuable of trees for prairie planting.

Golden Russian Willow.—Has much the same habit as the white willow but grows faster, at least when young. Is more especially suited for hedges and shelter belts.

Box Elder.—A quick growing, short lived tree. The timber has no value except for fuel. Its chief value is as a nurse tree and for lawn and street planting. Unless the top is kept thinned out it becomes scraggy and makes a poor growth. With heavy pruning from the time it is a young tree it grows into a symmetrical tree that makes a dense shade.

Burr Oak.—This is the only native oak. Its timber is valuable for many purposes, but its growth is too slow to make it a profitable tree for planting.

White Poplar.—A native tree growing in dense groves along the streams and in the northern part of the state. Grows rapidly for the first fifteen years. Will produce as high as ninety cords of wood per acre with eighteen years' growth. As it springs up thickly from suckers, it reproduces itself without planting. On this account it is probably one of the best fuel trees than can be grown.

Hackberry.—A native tree having something of the character of the elm to which it is botanically related. While not attaining the size of the elm, it is in some respects a better tree, growing more symmetrically and thus requiring less attention. It is rather better adapted for lawn and street planting than for timber plantation, though it succeeds well there.

American White Birch.—When of sufficient size the birch is made into lumber for the manufacture of furniture and various wooden implements. The chief use of small trees, such as are found native in the northern part of the state, is for fuel. This tree makes a fairly rapid growth, and its extreme hardiness and striking beauty lead to its being largely planted.

STREET AND LAWN PLANTING.

The interest in tree planting to improve the appearance and comfort of our towns and villages is being made manifest in many localities. At other points little or nothing has been done, and as a result their cheerless and forlorn aspect makes a sorry comparison with the beauty and attractiveness of their more enterprising neighbors. All of the timber trees that have been named are more or less suited to street and lawn planting, and in addition there are other smaller sorts that are useful for ornamental purposes only.

Throughout the middle and northern states the elm is usually looked upon as the best tree for street planting, though at the

present time the box elder and the cottonwood are more extensively used in North Dakota. The elm combined with these, or rather with the Carolina poplar and box elder, makes a good combination. On the outside of the walk plant the Carolina poplar and elm alternately, leaving twenty feet between the trees. On the inside of the walk plant the box elders opposite the poplars. At the end of fifteen or twenty years the poplars should be removed, leaving the elm and box elder alternating on opposite sides of the walk with a space of forty feet between the trees of each row and a tree for every twenty feet along the walk.

It is the ordinary practice to set trees much closer than this and never remove them. Some people are too kind hearted to cut down a tree. Others have still kinder hearts and cut down some that the remainder may grow into natural and perfect shape. Such trees live longer and, unless one takes pleasure in deformed things, look better.

Trees for street planting should be nursery grown if possible, and in all cases should be headed high. The trunks should be straight and two inches or more in diameter, excepting the Carolina poplars, which may be smaller. It is difficult for a very small tree of most varieties to grow tall and symmetrical when set in an open and exposed place. They should be grown in the nursery long enough to give them an established form and character.

PRUNING STREET TREES.

The butchery that it has seemed fitting to perform on street trees to keep them within bound just at a time when they should be growing into their greatest beauty could be obviated by giving them the proper attention when young.

Branches of old trees are pretty sure to droop and get in the way unless headed well up from the ground and kept that way by cutting away the lower branches while they are small, long before the trees seem to need it. This process increases the rate of growth of the upper and outer branches and gives what is needed, a tall spreading tree.

The elm has a tendency to an irregular or even sprawling habit of growth. This should be corrected by cutting back the extending branches, making the top symmetrical. The box elder should be kept well trimmed from the bottom from the time it is planted, and its growth will be faster if the interior limbs are removed before they become too thick. Trees with open tops like the cottonwood may be improved by keeping the tops cut back, thus making them more dense. The hackberry requires little or no pruning except to keep the lower branches cut as it develops in height. The typical street tree is one headed high enough not to interfere with traffic and to allow an open view between the house and street, under the trees. The general effect is also infinitely better if the pruning be done gradually as the tree grows instead of waiting till

one final day and then cutting off most of the branches, leaving crippled, crooked trunks surmounted by a pinched and straggling top.

ORNAMENTAL TREES AND SHRUBS.

The average lawn requires but few large trees, and these will ordinarily be at the sides and rear. Small, compact trees and shrubs give a better effect, and these should be arranged so as not to break up the open effect in front nor interfere with good views from the house.

Planting in irregular masses about the boundaries of the place and close against the house, leaving a free, open expanse of lawn between, will give the best results.

We have over thirty shrubs growing upon the station grounds and there are very many more suited to this latitude. There are several trees, like the cut leaved weeping birch, mountain ash, blue spruce and Black Hills spruce, that are especially adapted for lawn planting.

The Cut Leaved Weeping Birch easily stands at the head of all trees for planting upon the lawn. It grows rather rapidly while young but never attains very great size. It should be planted where other trees will not crowd it and where the branches may be allowed to droop to the ground. On account of its rich and elegant appearance it must be planted very sparingly, not more than two or three trees upon small grounds.

The Mountain Ash is another tree of great beauty. Its rich, dark foliage and bright red berries give it a very striking appearance. It is perfectly hardy but somewhat liable to sunscald, making protection of the trunk necessary in very exposed places. Like the birch it should be planted sparingly.

The Colorado Blue Spruce is the most striking of all evergreens on account of its silvery blue color. It is hardy in northern latitudes, but should have some protection against south winds, as indeed all evergreens should. It grows into symmetrical form and because of its acknowledged beauty should be generally planted.

The Red Cedar is one of the hardiest of the evergreens, growing wild in the western portion of the state. It starts rather slowly, but soon grows about a foot a year, becoming a compact and very ornamental tree.

The Black Hills Spruce is a form of the white spruce, but often closely resembles the blue spruce in color. It is very hardy and desirable.

Of ornamental shrubs the common and Persian lilac, snowball, tartarian honeysuckle, barberry, red dogwood, burning bush, ninebark, spirea (*Van Houtii*), juneberry, chokecherry, buckthorn, whitethorn, buffalo berry, golden currant, elderberry (black), red berried elder, sumac and the rugosa roses are all easily grown and very ornamental.

They should be grown for the most part in clumps or masses close about the porch or sides of the house to relieve the bareness of the building, and also where walks diverge or curve, or against the larger trees to hide the trunks. Shrubs give a rich and soft aspect that cannot be attained by other forms of planting.

HEDGES.

The plants now growing at the station for hedge purposes are the buffalo berry, wild plum, silver leaf (*Eleagnus argentea*), caragana, buckthorn, Russian wild olive, tartarian honeysuckle, silver maple, golden Russian willow and red cedar.

They may be divided into two classes, those used for fences against stock and the strictly ornamental hedges, though of course all may be made more or less ornamental.

The golden Russian willow is the one we have planted most extensively probably because it costs less to get it started. It grows readily from cuttings, is very ornamental both in summer and winter, and when required grows large enough to make a fine shelter and heavy enough to protect against stock.

The cuttings are set early in the spring about a foot apart and in soil that can be kept cultivated. The cultivation should continue along the sides of the hedge for three or four years. After the plants are two or three years old they should be cut back to the ground so they will make a dense growth. The other plants making heavy, stout hedges are the buffalo berry, wild plum, Russian wild olive and silver maple. These are not grown from cuttings, but from young plants. In some respects the buffalo berry makes one of the best hedges. It is of course perfectly hardy, is free from disease or insect attack, well armed with formidable spines, holds its foliage till very late in the season, and is very ornamental. The fruit is also valuable in making jelly.

When grown in cultivated ground it has the habit of sending up suckers about the old plants. While these may be easily kept down, yet the habit may be considered a slight objection to the plant. When the land alongside is seeded down the suckers do not appear.

The wild plum suckers worse than the buffalo berry, but as with that plant, when the land has once been seeded down, the tendency to sucker is not serious.

Both of these plants require less attention in the way of trimming than the willow, but on the other hand do not grow as fast. They should also be planted about a foot apart and kept cultivated till they are well established. The silver maple is a stronger grower than any of the plants mentioned and makes an excellent hedge. It requires, however, a deep, moist soil and is not generaly considered a success outside the Red river valley. Where a hedge is required large enough to afford a shelter it is probably the best plant to be found in soils where it will grow.

In starting a maple hedge seedlings of course will be used. The may be set one and a half or even two feet apart. If allowed to do so they will naturally grow in the form of a bush, which makes them the more valuable for hedge purposes. The silver maple is not so easy to start as the willow, but is rather more thrifty after the first few years, as the interior branches stand shade better than those of the willow.

The Russian wild olive has been tried but two years with us and in a small way at that. It is very highly spoken of as a hardy, drouth resisting plant. The tree growers in western Nebraska have placed it at the head of their list. It resembles the buffalo berry in the color of its foliage, but is a more rapid grower and more showy. The plants on the station grounds grew two feet last season. It has not winter killed with us, though Mr. Uelland at Edgeley reports the tops having killed back a little with him. It holds its foliage till winter, does not sucker, grows into good form for hedges and is well armed with stout spines. We shall plant it largely next spring. If it proves hardy it ought to make a valuable hedge about school grounds and similarly exposed places.

ORNAMENTAL HEDGES.

All of the other hedge plants named are valuable for ornamental purposes only, though some of them have been sold by tree peddlers under the name of "Siberian hedge," etc., with the assurance that they will turn stock in three years. It is impossible to tell which is the best of these as no one is the best for all purposes. The buckthorn makes an excellent hedge and in time will afford some protection against dogs and stock. It has rich, dark green foliage that remains on till late in the fall. It requires little attention, does not sucker, and makes a dense growth. It is slow about getting started, but does well when once established.

The caragana starts readily and will make a fairly good hedge in three years. The foliage is light green, and while very beautiful in early summer is apt to rust and get dingy later in the season. It it very hardy and a valuable plant.

The silver leaf is a native of the state and is sometimes known as the badger bush. It grows readily into a low, pretty hedge, but suckers badly.

The tartarian honeysuckle is about the best plant, all things considered, for an ornamental hedge. It is perfectly hardy, a profuse bloomer, starts readily, is not subject to disease or insect attacks, and will succeed with any reasonable treatment.

It will grow eight or ten feet high as a dense, stout bush, or may be kept trimmed to any height. The red cedar is probably our surest evergreen and is well adapted for hedges. Trees obtained from Minnesota seem perfectly hardy. It is not a rapid grower, though last season our trees made a growth of about a foot. It is of course an ornament the year round, and for that reason

Plate V—Young Plum and Apple Trees, North Dakota Experiment Station.

should appeal to those wanting something unusually fine if they are prepared to give it the attention it demands till it becomes established. The plants of the red cedar should be set about two feet apart, of the others named about one foot.

TRIMMING HEDGES.

For this purpose a straight corn knife kept well sharpened is used. The straggling branches are lopped off by quick upward strokes. The trimming may be done any time in the summer, not later than the last of July, or the last thing before winter sets in. Trimming in late summer causes a new growth to start that is likely to be winter killed. The older branches in a hedge as they begin to get scraggy may be cut out entirely, and sometimes it is necessary to cut the whole hedge back to the ground to get a new, healthy growth.

No one feature on our own grounds is more admired than the hedges, and considering the ease with which they are grown and the necessity for some sort of boundary about the place for shelter and protection, there is no reason why they should not be universally planted.

FRUIT CULTURE.

The success that the Experiment Station and many private growers have had with small fruits has led to numerous inquiries as to the methods employed and the varieties that may be recommended. We do not advise anyone to attempt the cultivation of fruits without providing for their shelter by means of windbreaks. This is particularly true of strawberries, that suffer greatly through the effects of drying south winds, and applies in a greater or less degree to all fruits.

The shelter should be along the south as the destructive winds come from that quarter. For the location of the fruit plantation select a north or northeast slope where it can be obtained, and at any rate avoid a south or west one.

Provision must also be made such that water will not remain on the ground for any length of time during the spring thaws or after heavy rains.

Where the rainfall is not heavy, as in North Dakota, one should avoid a sandy or gravelly soil. In mellow soil the roots of strawberries extend down two and one-half feet and of the other fruits probably as deep. From this fact will be seen the necessity of providing a place having a deep, mellow soil free from gumbo and of course from alkali.

Any soils excepting those naturally too light will be benefited by a deep plowing and subsequent firming down with a harrow. We have not found it necessary or even profitable to fertilize the soil at the Station on which fruit is growing. Of course soil having a much less degree of fertility would be benefited by plowing under

a good dressing of well-rotted stable manure. Unless it is so thoroughly decomposed as to mix readily with the soil it will be better not to use any. It is generally recommended that currants and gooseberries have heavier soil than raspberries, and while that rule may be successfuully applied in localities having variable soil and a heavy rainfall it is sufficient to say under our own conditions that the deepest and best soil should be selected on which to grow all of our fruits. While there are undoubted difficulties to be encountered in growing fruit in North Dakota, still some of the fruits may be made to do unusually well here, and considering the high prices to be obtained others are quite as profitable here as in more favored localities.

PLUMS.

The plum is the most valuable fruit for North Dakota and doubtless will be for years to come. Wild plums of many types, some of them of excellent quality, are found growing in all parts of the state. The demand for these now far exceeds the supply, and the general cultivation of the plum should begin at once.

Many of the thickets contain trees bearing fruit of good quality, and these may be transplanted to the home garden with profit. A hundred trees thus selected twelve years ago have been growing upon the Station grounds since, and have been the source of hundreds of seedlings that are now coming into bearing. In this way improved varieties may be obtained that are of course well suited to the different localities in which they are grown. In this way also one may be sure of securing a variety sufficiently early to ripen before frosts, as all of the sorts of the American plum brought from other localities will not. There are now over a hundred varieties of the same plum that is found growing wild in our state offered for sale.

A few of these are growing at the Station, the most of them just coming into bearing. These were only partially protected on the south, and last fall a violent gale coming just after an excessive fall of rain blew them over. They were then removed to a better protected location. This circumstance shows that it is quite necessary to provide good shelter, though it must not be placed so as to allow the snow to drift over the trees.

The trees may be further protected by planting them close together, as close as six by ten feet. They should be planted considerably deeper than they grew in the nursery row or native thicket. This will enable them to stand the winds better and will afford better root protection in winter.

Before planting the land may be ridged by plowing it in narrow strips, setting the rows of trees between the ridges in the dead-furrows, pulverizing the soil well first. With this method of planting, which insures against loss from drouth, a quantity of black surface soil should be put around the roots of each tree in planting.

Plate VI—De Sota Plum Tree in Fruit. North Dakota Experiment Station.

Keep the grass and weeds out and the soil moist by frequent cultivation. The trees will begin bearing in three or four years. A mulch of old straw spread on the ground after cultivation for the season has stopped will prevent root-killing in any open winters. It may also be necessary to bind tar paper about the trunk of each tree in the winter to protect from mice and rabbits. There is a very large list of varieties to select from that are a decided improvement over the ordinary wild type, especially in size. Some of these ripen their fruit too late for the far north. The De Soto, Forest Garden, Cheney, Rolf, Rollingstone, Wyant and Surprise is the list recommended by the Minnesota Horticultural Society for general cultivation.

APPLES.

To the average man fruit growing means apples. All over the country, on farms where no special effort is made to raise fruit, one will find apple trees growing. Because of the great adaptability of the apple to meet varying conditions this is true over large regions that a generation or two ago produced no apples. Generally speaking it has been found that the apple is introduced into regions of new conditions only as new varieties have been created to suit these conditions. Practically all of the apples grown in the eastern states today are of varieties that were created there, and the same condition is being found true in the northwest. Aside from the Russian apples that were created under conditions similar to our own, the only possible apples with us are those like the Lyman's Prolific, Wealthy, Patten's Greening, etc., apples that originated in the northwest.

While the development of new varieties is a thing apart from apple culture as generally understood, yet in a new country where apple growing is more or less uncertain because of the absence of thoroughly hardy varieties all who are interested in the development of the apple industry will be planting apple seeds from time to time. In ten years most of the trees thus produced will be bearing fruit. There were exhibited at Minneapolis last fall over one hundred seedling apples, many of them of high quality, all grown from apple seeds planted ten years ago.

At the same time, it is possible to accomplish something with the varieties in existence. Crabs and hybrids of the following varieties have been found suitable for growing in the northwest: Virginia, Whitney, Early Strawberry, Minnesota, Gideon No. 6, Florence and Lyman's Prolific.

Among apples suited for the same region are the Duchess, Hibernal, Charlamoff, Patten's Greening, Wealthy and Malinda.

Apples in this region seem to succeed better if the trees are headed very low, those heading right at the ground after the original tree had killed back often proving the most profitable trees. Where the soil will admit it, it is advisable to plant the trees from six inches

to a foot deeper than they grew in the nursery. Trees thus planted naturally grow a little slower and ripen their wood better, thus possibly reducing the danger of blight and winter killing, and at the same time they are less affected by drouth.

Ordinary varieties may be planted about twelve by sixteen feet apart, or if they have good shelter and rich soil, sixteen by twenty feet. It is not wise to try and grow apples without a good shelter belt on the south and west. This may be planted at the time the trees are set. It is a poor plan to buy large trees. They cost more and are worth less for the planter. It is better to buy two-year-old trees or even root grafts. When one does not feel like investing much money in apple trees, he can buy root grafts of the best varieties for three or four cents each that will make him as good trees in eight or ten years as he would obtain through planting trees of the regular size. Root grafts should be planted deeply, leaving a single bud above the ground. The situation may be still further improved by planting them in a broad trench made with a plow

Clean cultivation for apple orchards is undoubtedly the best, especially in a dry country. In very wet seasons a bushel of oats to the acre may be sowed upon the land late in July and harrowed in. These will help the trees to ripen their wood and will afford a protection in winter. They will not greatly interfere with cultivation the following spring. The apple blight must be guarded against, and when twigs or branches turn brown and die, usually in June, they must be cut off and burned.

It is found best not to trim apple trees much in regions like our own, but rather to let the head grow dense and compact to protect the trunk and larger limbs. The line of successful apple culture has moved toward the northwest so rapidly during the past twenty-five years that North Dakota also has something more than a reasonable hope for future success.

CURRANTS AND GOOSEBERRIES.

These are already succesfully grown more or less in most sections of the state, yet there are thousands of homes where the cultivation of even these valuable and easily grown fruits is not attempted. They thrive best in deep, moist soil. Given that and clean cultivation at the same time, allowing about eight canes to grow to the hill, cutting out the canes four years old and allowing only enough new ones to grow each year to take their place, and any one can grow these fruits in abundance.

Set the plants four by eight feet apart, and see that the grass does not get a foothold among the plants. They will stand a richer soil than most fruits, and stable manure forked into the soil close to the plants will increase the yield. If too many canes are allowed to grow in a hill, the fruit is small though the seeds are sure to be all there.

Plate VII. Picking Strawberries. North Dakota Experiment Station.

The London Market is the best currant we have tried. The North Star, Red Dutch, Victoria, White Grape, Long Bunch, Holland, Pomona and Red Cross are all standard sorts. The Downing Champion and Houghton are the leading gooseberries.

RASPBERRIES.

Our success with raspberries has not been encouraging, though some have met with considerable success. With a better drained soil we think we could do better, but unless one is prepared to put considerable work upon his raspberry plantation, such as covering the plants in winter, keeping the suckers cut out as fast as they appear, etc., he had better confine himself to the other fruits.

This is not saying that with a good location and some time at his disposal a man might not be well repaid in his efforts to grow raspberries. There is no particular secret in their cultivation, at least if there is we haven't found it here. Set the plants four by eight feet apart, far enough to make cultivation easy. Allow six new canes to grow in each hill each season, cutting out all the rest. Remove the old canes in the fall, those that have borne fruit, so the new ones may be protected easier.

For protection bend them all to the north, throwing dirt on the tops to hold them down. After that plow a furrow on either side of each row, throwing the soil over the plants. If covered with straw they are liable to injury from mice. Lift the canes in the spring as soon as the weather is settled.

About the only varieties that have made much of a showing with us are the Cardinal, Colorado, Iron Clad and Loudon.

STRAWBERRIES.

Since our windbreaks have become established we have not experienced much difficulty in producing a good crop of strawberries each year. Last season there was no rain to speak of till after the fruit was ripe and yet the yield was very good.

The strawberry requires a well drained but moist soil. Avoid land that is very weedy, especially that containing foxtail and quack grass. Set the plants in early spring, planting them firmly with the roots spread out and extending straight down, and the crown just at the surface of the ground. Give them plenty of room to make cultivation easy and to allow each plant a good share of moisture. We set our plants two by four feet apart. If the soil is rather dry or weedy keep all of the runners cut off for the first season and make the cultivation very thorough.

If the soil conditions are good about three runners may be allowed for each plant, training them along the row so they will not interfere with cultivation. In the fall after the ground begins freezing cover with three inches of straw that is free from seeds of any kind. Take it from the side of the straw pile opposite from where the

machine stood. In the spring, when the straw is dry on top but still somewhat moist at the bottom, it may be burned off. If done at the right time enough will remain to spread about the plants as a mulch to retain the moisture and to keep the berries clean. After the first crop has been harvested the bed must be put in shape for the following year's crop. This is done by thorough cultivation for the remainder of the season, and the removal of runners as they appear.

It must be remembered that the fruit for any given season is all provided for and made ready the previous season. Unless the plants are kept thrifty and vigorous they will not find it possible to prepare for much of a fruit crop. In July and August the soil will become hard and baked unless constantly stirred. It is just at this time, however, that the plants should be doing their best work for the future and must not be neglected. If the bed is well tilled after the first crop, removing most of the old plants and encouraging the young ones, the second crop will be as large as the first one. By continuing this same method we have grown three good crops in succession on the same land, and last season one old bed was put into shape to see what the fourth crop will amount to. It is generally advised, however, to grow but two crops and then plow up the bed.

VARIETIES.

Out of the thirty-four varieties in the trial bed last season the following gave the highest yields, coming in the order named: Warfield, Tennessee Prolific, Emperor, Senator Dunlap, Sample, Wm. Belt, Beder Wood, Drouth King and New York. Of these the Warfield and Sample are not self-fertilizing and will need to be planted in alternate rows with some of the other varieties.

Considering vigor, hardiness and quality, the Senator Dunlap made perhaps the best showing. Twenty-four plants set in 1902 gave twenty-four and one-half quarts in 1903.

The Wm. Belt is another excellent berry and very large. We raised single specimens measuring seven inches in circumference, twelve of them filling a quart box. In all the tests made the plants were not watered. While the price for strawberries in North Dakota is very high, still we would not advise growing on a large scale till one is able to grow them successfully in a small way. To be successful one year with another it will be necessary to have a well sheltered location. With a good location and a thorough knowledge of the business, a profit of from $200 to $500 per acre should be obtained. The late varieties will ordinarily pay the best, as everything is out of the market by the time they are ready, and 15 to 18 cents wholesale can easily be obtained. Whether the proposition from a financial side is an enticing one or not, there are few people so situated that they may not have an abundance of this excellent fruit for home use.

C. B. WALDRON.

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